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COMMENTS ON EMR DISCUSSION PAPER ON OXYGENATED GASOLINES.

COMMENTAIRES SUR LE DOCUMENT DE TRAVAIL D'EMR SUR L'OXYGÉNATION DE L'ESSENCE.

TE-87-14
Décembre 1987
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List of commentators

Ontario Ministry of Energy

Saskatchewan Ministry of Economic Development and Trade

British Columbia Ministry of Energy, Mines and Petroleum Resources

Shell Canada Limited

Texaco Canada Inc.

Esso Petroleum Canada

Mohawk Oil Co. Ltd.

Petro-Canada Inc.

Ethyl Canada Inc.

Canadian Oxygenated Fuels Association

Commercial Alcohols Limited

St.Lawrence Reactors Limited

Ontario Corn Producers' Association

Western Canadian Wheat Growers Association

Techtrol Ltd.

General Motor of Canada Limited

Chrysler Canada Ltd.

PREFACE

In early 1987, the Department of Energy, Mines and Resources published a discussion paper on "Oxygenated Gasolines", designed to solicit the views of industry for use in a national policy formulation. The purpose of this report is to summarize views and comments received, from interested parties, on the role that oxygenated gasolines should play in Canada. This is not an official publication of Energy, Mines and Resources Canada. It is an internal report of the Transportation Energy Branch, and is made available in this format to a limited audience for information and discussion purposes.

PRÉFACE

Au début de l'année 1987, le ministère de l'Énergie, des Mines et des Ressources (EMR) a publié un document de travail sur l'oxygénation de l'essence, sollicitant ainsi les vues de l'industrie afin d'en tenir compte lors de l'élaboration d'une politique canadienne. Le présent rapport résume les vues et les commentaires formulés par les divers groupes et portant sur le rôle que les essences oxygénées devraient jouer au Canada. En l'occurrence, il ne s'agit pas d'un document officiel d'EMR, mais d'un rapport interne que la Direction de l'énergie reliée au transport destine à un nombre restreint d'intervenants afin de diffuser l'information et de susciter un débat.

Ontario Ministry of Energy

OME feels that the report presents an excellent overview of the economics of producing oxygenates. The OME offers the following comments:

1. use of oxygenated fuel in older cars can make a significant improvement in their exhaust emissions, sufficient to overcome increased evaporative emissions;

2. OME believes that the section on social cost-benefit analysis is too narrow in approach. OME suggests that oxygenated gasolines should have been looked at in comparison with other supply projects such as oil sands;

3. OME believes that the analysis should have included environmental, farm income, gas producer income, and all secondary benefits which would accrue from a national alcohol program.

4. OME believes that the potential of alcohol fuels to extend Canada's gasoline supply offers significant energy security benefits.

Saskatchewan Economic Development and Trade

SEDT believes that the discussion paper provides a fair presentation of the issues related to oxygenated gasolines. However, it believes that the section dealing with regional and provincial considerations in Saskatchewan does not fully consider the current structure of Saskatchewan's energy environment. SEDT believes that there is no direct conflict between the use of oxygenated gasolines and the upgrading of heavy oil. The Saskatchewan government

Ministère de l'Énergie de l'Ontario (MEO)

Selon le MOE, le rapport présente un excellent aperçu de la rentabilité de la production d'oxygénats. Le MEO a fait les observations suivantes :

1. L'utilisation d'essence oxygénée dans de vieilles voitures peut réduire de beaucoup les émissions de polluants gazeux, ce qui compenserait l'augmentation des émissions de vapeur.

2. La section Analyse coûts-avantages sociaux a une approche étroite. Les essences oxygénées auraient dû être comparées aux autres options d'approvisionnement, comme les sables bitumineux.

3. Il aurait fallu y inclure les questions environnementales, les revenus agricoles, les recettes des producteurs de gaz et tous les avantages secondaires qui découleraient d'un programme canadien.

4. Le MOE est d'avis que, dans la mesure où ils permettent d'accroître l'approvisionnement en essence du Canada, les carburants alcoolisés peuvent procurer d'importants avantages au chapitre de la sécurité énergétique.

Saskatchewan Economic Development and Trade (SEDT)

Le SEDT est d'avis que l'étude présente objectivement la question des essences oxygénées, mais que la section Considérations provinciales-régionales sur la Saskatchewan ne tient pas tout à fait compte de la structure actuelle de la

believes that the production of ethanol can both diversify the agricultural sector and contribute to further economic development.

The B.C. Ministry of Energy, Mines and Petroleum Resources

The B.C. Energy Ministry believes that at today's grain prices the production cost of ethanol should be in the lower end of the range of costs presented in the discussion paper. It believes that the "window of opportunity" is an important issue to consider if oxygenated gasolines are are to play a significant role in Canada.

Shell Canada Limited

Shell notes that the discussion paper presents a clear statement of the technical difficulties involved in using oxygenated gasolines. Five particular points deserve greater emphasis, in Shell's belief.

1. Shell believes that the results of the linear program refinery analysis overestimate the financial viability of oxygenated gasolines. Shell's own analysis indicates that changes in refinery processing are a more viable alternative than oxygenated fuels.

2. Shell disagrees with the statement that the introduction of oxygenated fuels would have little impact on the oil industry. In Shell's opinion the introduction of significant volumes of oxygenated gasolines would lead to the closure of at least one refinery, representing a capacity of fifty thousand barrels per day.

situation énergétique de la province. Selon lui, il n'existerait aucun conflit entre l'utilisation des essences oxygénées et la valorisation du pétrole lourd. Le gouvernement de la Saskatchewan estime que la production d'éthanol peut diversifier le secteur agricole et contribuer au développement économique.

Le ministère de l'Énergie, des Mines et des Ressources pétrolières de la Colombie-Britannique

Vu les cours céréaliers actuels, le prix de revient de l'éthanol devrait se situer au bas de la fourchette des coûts présentés dans l'étude. Le Ministère estime qu'il importe de tenir compte des "possibilités de succès", si l'on veut que les essences oxygénées jouent un rôle important au Canada.

Shell Canada Limited

Shell croit que le rapport énonce clairement les contraintes techniques reliées à l'utilisation des carburants oxygénés. Selon elle, il aurait fallu insister davantage sur les cinq points suivants :

1. A en juger par les résultats du modèle de programmation linéaire de raffinerie, on surestime la viabilité des mélanges oxygénés. De plus, le modèle utilisé par Shell indique que la modification des procédés de raffinage semble une meilleure solution.

2. Shell ne croit pas que l'introduction des carburants oxygénés n'aurait que peu d'impact sur l'industrie du pétrole. L'introduction massive des carburants oxygénés entraînerait

3. Shell believes that the discussion paper exaggerates the impact on employment.

4. Shell believes that the report underestimates the adverse reaction of consumers, if they are required to purchase a fuel which reduces the performance of their vehicles.

5. In general Shell believes the recommendations of the standing committee on Energy, Mines and Resources, in its report on alcohol gasoline blends, are appropriate. These recommendations are that the government should support research, development and demonstration in order to resolve the remaining problems that affect the use of oxygenated gasolines.

6. Shell is concerned regarding risk of ground water contamination due to potential incompatibility of gasolines containing methanol with other underground storage tanks internal coatings.

7. Shell notes that use of oxygenates will increase gasoline RVP, unless compensated by butane removal. This may be directionally incompatible with VOC emission reduction

Texaco Canada Inc.

Texaco Canada notes that the discussion paper presents a reasonable evaluation of the advantages and disadvantages of the use of oxygenated gasolines.

plutôt la fermeture d'au moins une raffinerie (réduction de capacité d'environ 50 000 bbl/jour).

3. Les répercussions sur l'emploi sont surévaluées.

4. Le rapport sous-estime les réactions des consommateurs face à un carburant dont l'utilisation réduirait le rendement des véhicules.

5. En général, Shell appuie les recommandations du Comité permanent de l'énergie, des mines et des ressources qui encourage le gouvernement du Canada à supporter la recherche, le développement et les programmes de démonstration. Ces mesures permettront d'examiner de plus près les problèmes reliés à l'utilisation des carburants oxygénés.

6. Shell se préoccupe des risques de contamination des eaux souterraines, vu l'éventuelle incompatibilité entre les mélanges méthanol-essence et le revêtement interne des réservoirs enterrés.

7. Shell signale que l'utilisation d'oxygénats fera grimper la tension de vapeur Reid (TVR) de l'essence, à moins de compenser par l'élimination du butane, ce qui irait à l'encontre d'une réduction des émissions de composés organiques volatils.

Texaco Canada Inc.

Texaco croit que le rapport présente une évaluation équitable des avantages et inconvénients reliés à l'utilisation des carburants oxygénés.

Esso Petroleum Canada

Esso views are summarized as follows:

- MTBE is the most acceptable oxygenated component from the technical viewpoint.
- Alcohol blends will be less acceptable to the consumer than conventional gasoline.
- Esso is concerned with the opposition of some vehicle manufacturers, particularly with respect to the use of methanol in gasoline.
- The capacity of the distribution system to handle oxygenated gasoline, and the costs involved, are a cause of concern.
- Esso believes that use of alcohols would be a more expensive solution to octane than other sources available to the refinery industry.

Despite this Esso continues to follow the development of oxygenated gasolines, and will continue with its evaluation of the possible benefits from use of such blends.

Mohawk Oil Co. Ltd.

Mohawk notes that in its belief the discussion paper underestimates the environmental benefits which result from the use of alcohol-gasoline blends. Mohawk notes also that the discussion paper ignores the potential benefits for the agriculture industry which could result from the production of ethanol. Mohawk also believes that the technical problems described in

Esso Petroleum Canada

La position d'Esso se résume comme suit :

- L'EBTM est le composant oxygéné le plus acceptable au plan technique.
- Les consommateurs accueilleront moins bien les mélanges alcoolisés que l'essence classique.
- Esso se préoccupe également de l'opposition des constructeurs de véhicules aux mélanges contenant du méthanol.
- La capacité et les coûts reliés à la distribution des mélanges alcoolisés l'inquiètent.
- L'utilisation des alcools serait une solution coûteuse comparativement à d'autres sources d'octane.

Esso continuera cependant de suivre le développement des carburants oxygénés et d'évaluer les bénéfices reliés à leur utilisation.

Mohawk Oil Co. Ltd.

Mohawk est d'avis que le rapport sous-estime les bénéfices environnementaux qui résulteraient de l'utilisation des mélanges alcoolisés. De même, elle croit que le rapport ignore les retombées éventuelles pour le secteur agricole qui résulteraient de la production d'éthanol. Selon Mohawk, il semble que certains problèmes techniques aient été exagérés dans le rapport; par exemple, le problème de corrosion associé aux mélanges alcoolisés contenant du méthanol serait aussi un

the report are made out to be much more serious than is the case in practice. An example is corrosion associated with methanol blends, which Mohawk believes is no more serious than corrosion with ordinary gasolines when water is present. Mohawk does not agree with the results of the Esso Petroleum Canada test with respect to fuel consumption, and believes that any test program based on a sample of only five vehicles is unlikely to be particularly useful. Mohawk believes several other tests show an improvement, or at worst a very slight increase, in fuel consumption on oxygenated gasolines.

Petro Canada

Petro Canada believes that oil companies must above all satisfy their customers if they are to remain successful. It believes that current technology only allows use of certain oxygenated components if consumer satisfaction is to be unaffected. In particular, Petro Canada believes MTBE is the most satisfactory oxygenate at present. Before alcohol fuels could be widely used there are a number of barriers that must be resolved. These barriers concern technical questions, environmental impact, and the distribution of oxygenated fuel. Only MTBE causes no concern with respect to these barriers. For oxygenated gasolines to be viable it must be possible to produce them in an optimal fashion, taking into account gasoline production and consumer satisfaction.

Petro Canada also believes that oxygenated fuels could play an important role one day in the transportation sector. It is more likely, however, that alcohols will be

problème sérieux lorsque les essences ordinaires sont en présence d'eau. Mohawk est en désaccord avec les résultats du test effectué par Esso sur la consommation de carburant et réplique qu'un test ne portant que sur un échantillon de cinq véhicules n'est pas très utile. D'autres tests démontraient une faible amélioration ou, au pire, une légère hausse de la consommation lors de l'utilisation des mélanges oxygénés.

Pétro-Canada

Pétro-Canada croit que les pétrolières doivent avant tout satisfaire les consommateurs afin de prospérer. Les technologies actuelles ne permettent que l'utilisation de certains composants oxygénés sans porter atteinte au niveau de satisfaction des consommateurs. Ainsi, l'EBTM semble être l'oxygénat le plus prometteur. Avant de considérer l'utilisation à grande échelle des carburants alcoolisés, plusieurs barrières au plan de la technologie, de l'environnement et de la distribution doivent être surmontées. Seul l'EBTM ne pose pas ces problèmes. La viabilité des carburants oxygénés dépendra de l'optimisation de la production, en fonction des intérêts des producteurs d'essence et de la satisfaction des consommateurs.

Pétro-Canada estime également que les carburants oxygénés pourront jouer un rôle dans le secteur des transports, mais que les alcools alimenteront probablement des véhicules spéciaux ou serviront à la fabrication d'autres carburants oxygénés. De plus, Pétro-Canada estime que des programmes gouvernementaux destinés à encourager

used in dedicated vehicles, or would be a base for the manufacture of other oxygenated fuels. Petro Canada also believes that it is not desirable for government programs to encourage the use of oxygenated gasolines that would not otherwise be viable in the market, because this would only result in long term problems both for the oil industry and for consumers.

Ethyl Canada Inc.

Ethyl believes that refiners could avoid investment in an isomerization unit by increasing reforming severity over the 93 RON which was the upper limit used in the analysis presented in the EMR discussion paper. This solution may not be optimal, however, the lack of capital in the refining industry may force refiners to opt for this route. Ethyl also believes that the report overestimates the benefits associated with the use of oxygenated fuels. In fact, Ethyl notes that the analysis assumes that MMT will not be allowed in gasoline, however, at present there is no indication that MMT will be banned in Canada.

Canadian Oxygenated Fuels Association

COFA considers that the report ignores or seriously understates the major benefits of oxygenated gasolines, especially alcohol blends. As such, the report does not form an adequate basis for assessing the value of fuel alcohols to Canada. Of particular concern is the fact that the report ignores the significant contribution that alcohol blends can make to air quality, despite the wide recognition that this is receiving in the United States. In addition, the report does

l'utilisation de carburants oxygénés autrement non viables ne pourront à long terme que nuire à l'industrie pétrolière et aux consommateurs.

Ethyl Canada Inc.

Ethyl croit que les raffineurs pourraient éviter d'investir dans des unités d'isomérisation en augmentant la sévérité de reformage au-dessus du plafond de 93 RON utilisé dans le rapport. Même si ce procédé ne represente pas une solution optimale, les raffineurs pourraient le choisir, vu les capitaux disponibles. Le rapport surestime les avantages reliés à l'utilisation des carburants oxygénés en supposant que le MMT ne sera pas permis, alors que toutes les indications actuelles ne permettent pas de prévoir son interdiction.

Association canadienne des carburants oxygénés (ACCO)

Selon l'ACCO, le rapport ignore ou sous-évalue les importants avantages des essences oxygénées, notamment des mélanges alcool-essence. De ce fait, il ne constitue pas un fondement adéquat pour évaluer la portée des carburants alcoolisés au Canada. En particulier, il passe sous silence le rôle de premier plan que ces derniers peuvent jouer dans l'assainissement de l'air et ce, malgré tout l'intérêt que cet aspect suscite aux Etats-Unis. De même, il ne fait pas état des retombées considérables éventuelles au chapitre du développement régional, de l'agriculture, de l'industrie forestière, des producteurs de gaz naturel et de méthanol ainsi que de la sécurité énergétique. De plus, l'ACCO

not recognize the major impact that alcohol blends can make to regional development, agriculture and forestry, the natural gas producers, energy security and the methanol industry. COFA is also concerned that the report does not clearly enunciate those conditions under which alcohol blends are commercially viable, namely environmental parity with the United States.

Commercial Alcohols Limited

CAL supports the comments formulated by Mohawk. Furthermore CAL believes that the positive impact of oxygenated gasolines on the environment and the public health should have had more emphasis in the report. The only additional concern CAL addresses is related to the section of the report that deals with the environmental impact of ethanol production using enzymes. CAL notes that cellulase has been produced and used for many years in Canada, and that there are no environmental or occupational health hazards of any concern.

St. Lawrence Reactors Limited

SLR believes that the overall report presents a clear and detailed analysis of the technical issues related to the use of oxygenated fuel. SLR raises the five following comments:

1. Technical concerns: SLR believes that the remaining technical issues can be solved with the cooperation of the refining industry and car manufacturers.

reproche au rapport de ne pas énoncer clairement les conditions de viabilité des carburants oxygénés, notamment la question de la parité environnementale avec les États-unis.

Commercial Alcohols Limited (CAC)

CAL endosse les commentaires émis par la firme MOHAWK et affirme que les effets positifs sur l'environnement et la santé publique auraient dû occuper une place plus grande dans le rapport. De plus, CAL se préoccupe de la section du rapport qui traite des retombées environnementales de la production d'éthanol à partir d'enzyme. CAL réplique qu'on produit de la cellulase depuis des années au Canada, sans que cela ne pose des problèmes au chapitre de l'environnement et de l'hygiène au travail.

St. Lawrence Reactors Limited (SLR)

SLR croit que, dans l'ensemble, le rapport présente une analyse claire et détaillée des facteurs techniques reliés à l'utilisation des carburants oxygénés. SLR soulève les cinq points suivants :

1. Contraintes techniques. Certains problèmes techniques existant encore peuvent être résolus, moyennant la collaboration entre les raffineurs canadiens et les constructeurs automobiles.

2. Appui des raffineurs. SLR croit que les raffineurs canadiens n'encourageront pas l'utilisation des carburants oxygénés tant et aussi longtemps qu'ils n'en

2. Refiners' support: SLR believes that refiners will not support the use of oxygenated fuels until there is a need for octane and that oxygenated fuels are financially viable.

3. MTBE vs alcohols: SLR recognizes that MTBE is an excellent product and that it would probably be the refiners first choice for an oxygenate in a free market. SLR believes that governments will have to offer subsidies if they want to see alcohol fuels in the market place.

4. Environmental benefit: SLR believes that the report does not clearly reflect the environmental benefit that would accrue from the use of oxygenated fuels.

5. Renewable energy: SLR believes that the report does not put enough emphasis on the fact that ethanol can be produced from renewable resources.

Ontario Corn Producers' Association

The association believes that the discussion paper:

1. seriously underestimates the benefits to the agricultural community, particularly that of Western Canada, through the development of a major new market for grain used for ethanol production, and the potential for creation of employment and economic development in these communities;

n'auront pas besoin pour rencontrer leurs besoins en octane et tant que ces produits ne seront pas financièrement attrayants.

3. EBTM par rapport aux alcools. SLR reconnaît que le EBTM est un excellent produit et qu'il serait le premier choix des raffineurs dans un marché libre. SLR croit que le gouvernement devra offrir des subventions à court terme pour favoriser la percée des carburants alcoolisés.

4. Avantages environnementaux. SLR croit que le rapport n'exprime pas clairement les avantages environnementaux qui découleront de l'utilisation des carburants oxygénés.

5. Energie renouvelable. SLR croit que le rapport ne met pas en évidence le fait que l'éthanol serait une source d'énergie renouvelable.

L'Association ontarienne des producteurs de maïs

L'Association croit que le rapport :

1. sous-évalue gravement les avantages économiques dont bénéficierait les régions agricoles, particulièrement l'Ouest canadien, grâce aux nouveaux débouchés importants pour les céréales de même que les possibilités de création d'emplois et de développement économique dans ces régions;

2. effectively ignores the potential contribution of ethanol and methanol to energy security, and the cost effectiveness of ethanol-methanol relative to other "new sources" of domestic light crude oil;

3. has given excessive attention to possible difficulties without evidence to show these difficulties are in fact significant;

4. underestimates the environmental benefits that would result from the use of oxygenated fuel;

5. exaggerates the technical concerns such as driveability, fuel efficiency, pipeline transportability, and water contamination in service station tanks.

Western Canadian Wheat Growers Association

The association disagrees with the statement that the provinces of Saskatchewan and Manitoba are not likely to benefit from the development of an oxygenated fuels industry in Canada. It believes that the development of a locally-based ethanol industry could have regional impact, economic and employment spin-offs in all western Canada. The association believes that properly formulated gasoline blends perform satisfactorily, therefore cooperation between governments and industry is required to allow oxygenated gasolines to enter the marketplace.

2. passe sous silence le potentiel de l'éthanol et du méthanol au chapitre de la sécurité énergétique, de même que la rentabilité des ces oxygénats par rapport à d'autres "nouvelles sources " de brut léger canadien;

3. exagère les difficultés potentielles, sans preuve à l'appui;

4. sous-estime les avantages environnementaux qui résulteraient de l'utilisation des carburants oxygénés;

5. amplifie les problèmes techniques tels que l'agrément de conduite, les normes de consommation de carburant, le transport par pipeline et la contamination des eaux par les réservoirs des stations services.

Western Canadian Wheat Growers Association

L'Association ne partage pas l'avis selon lequel la Saskatchewan et le Manitoba ne profiteront probablement pas du développement de l'industrie des carburants oxygénés au Canada. Une industrie locale pourrait, au contraire, produire des retombées au chapitre de l'économie, du développement régional et de la création d'emplois partout dans l'Ouest. L'Association soutient que des mélanges d'essences oxygénées bien dosées peuvent fournir un rendement satisfaisant. Il importe, par conséquent, que les gouvernements et l'industrie travaillent de concert afin de permettre aux essences oxygénées de percer sur le marché. Afin que le gouvernement encourage

The association suggests the three following options that government could pursue in order to encourage the use of oxygenated fuels:

1. an accelerated lead phase-down program;

2. a ban on MMT;

3. a five year relief of federal taxes of 2-3 cents per litre on ethanol blended fuels.

Techtrol Ltd.

Techtrol recognizes that fuel volatility of EM blends is an issue with the Transportation Fuels Group of EMR and submits that this is a technical issue, which should be resolved on technical grounds. Further, Techtrol claims that there is sufficent information available to resolve the issue at this time and states that this resolution should not require concensus agreement from the oil companies.

Techtrol believes that, too much attention, in the Discussion Paper, has been focussed on perceived problems which could affect the oil industry and too little on the role of the Canadian Government in its duty to ensure that the correct decisions are arrived at for the overall economic well-being of all Canadians in a move towards oxygenates.

Techtrol summarized its position as follows: Alcohol blends are the lowest cost, highest employment, practical automobile fuels octane additives available today. They have the additional advantage of effecting major environmental improvements through reduced emissions.

leur utilisation, l'Association propose les trois options suivantes :

1. un programme accéléré d'élimination du plomb;

2. interdiction du MMT;

3. une réduction des taxes fédérales de 2 à 3 cents par litre d'éthanol pour une période de cinq ans.

Techtrol Ltd.

Techtrol affirme que :

la volatilité des mélanges méthanol-éthanol pose un problème pour la Division de l'énergie reliée aux transport d'EMR et qu'il s'agit d'une question technique qui devrait être réglée comme telle. A ce stade-ci, l'information disponible permettrait de redresser la situation sans obtenir d'abord un consensus parmi les pétrolières.

que le document insiste trop sur la façon dont serait désavantagée l'industrie pétrolière et trop peu sur le rôle à jouer par le gouvernement du Canada pour s'assurer que les bonnes décisions sont prises en vue du bien-être économique de tous les Canadiens. Plus particulièrement, il faudrait veiller à la création d'une industrie énergétique mieux équilibrée.

en somme, les oxygénats sont, à l'heure actuelle, les agents d'amélioration de l'indice d'octane au moindre coût les plus pratiques, en plus d'offrir les meilleures possibilités de création d'emplois. De plus, ils ont l'avantage de réduire les émissions de polluants, d'où une nette amélioration de la qualité de l'environnement.

General Motors of Canada Ltd.

In GM's view the discussion paper provides a good analysis of the relative merits of different oxygenated gasolines. However, GM has a number of concerns with respect to the technology and economics of using such blends.

- GM believes that consumers would not be prepared to sacrifice performance of their vehicles on blended gasolines.

- GM is concerned that alcohol-gasoline blends would have a corrosive effect, particularly on older vehicles.

- GM believes that the fuel consumption penalty associated with blends is nearer two percent, rather than the one percent noted in the discussion paper.

- GM notes that the economic analysis provides a reasonable basis for assessment of blends, but that in actual practice it is important to consider individual refineries in order to properly establish the benefits and costs associated with use of oxygenated fuels.

Chrysler Canada Ltd.

Chrysler believes that the adverse effects of alcohol-gasoline blends in several areas are underestimated in the Discussion Paper. In particular, Chrysler believes that the deterioration in driveability and the long term effect on materials are not properly treated. Chrysler also believes that the octane sensitivity of some alcohol-gasoline blends and the durability problems that this may cause are understated. Finally, long

General Motors of Canada Ltd.

General Motors (GM) croit que le rapport fournit une bonne analyse des mérites relatifs aux différents carburants oxygénés. Cependant, GM a des doutes concernant les aspects techniques et économiques quant à leur utilisation :

- Les consommateurs ne sont pas prêts à sacrifier la performance de leurs vehicles.

- L'effet corrosif des mélanges alcoolisés sur les véhicules plus âgés est une source de préoccupation.

- La hausse de consommation de carburant serait de 2 pour 100 et non de 1 pour 100, comme l'indique le rapport.

- Les analyses économiques sont un bon début, mais en réalité, il importe de tenir compte des raffineries individuelles, afin d'avoir une bonne analyse coûts-avantages de l'utilisation des carburants oxygénés.

Chrysler Canada Ltd.

Chrysler croit que le rapport sous-évalue, dans plusieurs domaines, les effets néfastes de l'utilisation des carburants alcoolisés, notamment une performance (agrément de conduite) à la baisse et l'usure des matériaux à long terme. De même, la sensibilité de l'essence de certains carburants alcoolisés et les problèmes de durabilité subséquents sont sous-évalués. Enfin, on n'y fait nullement état des effets à long terme

term effects of greater deposit buildup on performance and emissions are not covered.

In Chrysler's view it is important that the economic analysis of oxygenated gasolines includes the costs assiciated with increased repair and maintenance of vehicles using blends, or alternatively, the increased costs on the part of manufacturers for making their vehicles fully compatible with alcohol blends.

de l'encrassement sur la performance et les gaz d'échappement.

Selon Chrysler, il importe également que les analyses économiques tiennent comptent des coûts additionnels de réparation et d'entretien des véhicules utilisant les mélanges oxygénés ainsi que des frais subis par le constructeur pour les rendre pleinement compatibles avec ces mélanges.

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May 19, 1987

Dr. A. C. Taylor
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Dear Tony:

Subject: Comments on discussion paper
on oxygenated gasolines

You have requested that we comment upon the contents of this paper and presumably make suggestions for additions.

In general, we feel that it presents an excellent overview of the economics of the production costs of oxygenates. No doubt, proponents of a particular blending agent will find reasons to quibble about some of the numbers but the general conclusions will remain the same, ie. methanol blends are apparently economic in some refinery situations today and all the oxygenates except ethanol should be cost effective in 1992 if MMT is removed from the Canadian gasoline pool.

The report omits some facts that were known at time of writing that perhaps should be mentioned. These include:

- The use of oxygenated blends in older cars can make a significant improvement in their exhaust emissions, sufficient to overcome increased evaporative emissions. Since older

cars comprise the bulk of the fleet, the net effect upon the environment might be significantly positive. California data is at variance to the first paragraphs of Section 4.1.5.

- The cost of transportation from the point of manufacture of the oxygenate to the refinery or blending station seems to be omitted. This can be a significant factor depending upon the size and location of the oxygenate plant.

- The report discusses the possibility of importing Brazilian ethanol for initial market development purposes. We question the practicality of opening our market to imported ethanol and then attempting to cut off imports assuming that Brazilian ethanol can be landed in Canada at a lower cost than unsubsidized Canadian production. We understand that the Canadian Renewable Fuels Association no longer advocates the use of imports.

- Methanol blends are no longer in commercial use in the United States.

- Strong anti-alcohol advertising has been started by some major refiners that appears to be hurting ethanol blends sales.

Since the report was written, four major issues have emerged which should be considered in your final report -

- In a recent meeting with Ministry staff, PACE members indicated that a decision not to use alcohols to meet 1992 lead restrictions has already been taken. The "window of opportunity" may not exist.

- The environmental benefits of oxygenate blends are now considered sufficiently important that various governments and officials in the United States are advocating mandating the use of alcohol blends in certain areas that have significant air quality problems. Is this enviromental benefit real and is it applicable to some areas in Canada even though Clean Air Act equivalent legislation does not exist in Canada?

- Considerable pressure is being exerted in Canada, the United States and EEC countries to use fuel ethanol, subsidized if necessary, to solve agricultural surplus and farm income problems. Some discussion of the farm assistance potential for fuel ethanol would seem to be appropriate.

- An MTBE plant study has been announced in Alberta. If this plant is built, what is the probable effect upon the market for fuel ethanol and methanol?

Finally, our major concern is with the section on Social Cost-Benefit Analysis. This section does compare the various oxygenates with refinery upgrading but we feel that this section is far too narrow in approach.

Latest N.E.B. information predicts a shortage of Canadian light crude in the next decade. Widespread use of alcohols in gasoline could significantly delay the requirement to use heavy crude in our gasoline or delay the requirement to import light crude.

We believe that increased use of fuel alcohols should be objectively compared with other production alternatives such as increased tar sands production, heavy oil upgrades, very remote oil, etc. None of these "conventional" ways of obtaining additional petroleum supplies will happen without significant government subsidies. What is the cost of these alternatives to government compared to the incentives required to utilize existing Canadian methanol supplies more effectively and produce ethanol from Canadian grain? A method to reduce the current $3 billion subsidy to Western grain producers should be looked at seriously.

Ontario believes that there is an opportunity as part of the current review of National Energy Policy Options for EMR to put forward a clear policy position on the contribution that oxygenates can make to meeting future Canadian transportation fuel requirements. A tax and fiscal regime to implement this policy position should also be proposed.

A federal statement that alcohol fuels are in the national interest would be key to overcoming subjective and occasionally biased opposition to their use.

We believe that an objective social-cost benefit analysis covering environmental, farm income, gas producers income and all secondary benefits of a national fuel alcohol program is probably a prerequisite to this type of statement. With the formation of the Vice President's multi-agency working group in the U.S., we can expect the fuel alcohol proponents to request similar action here. This report would serve as an excellent starting point for this activity.

Yours truly,

Roger M.R. Higgin, PhD, MBA, PEng
Assistant Deputy Minister
Programs & Technology Division

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June 4, 1987

Roy Sage
Chief, Alternative Fuels
Transportation Energy Division
580 Booth Street
Ottawa, Ontario
K1A 0E4

Dear Sir:

Re: Discussion Paper on Oxygenated Gasolines

Thank you for sending the revised Discussion Paper on Oxygenated Gasolines, 1986. I am writing this response on behalf of Saskatchewan Energy and Mines, Executive Council, and my own Department of Economic Development and Trade. We believe that this Discussion Paper provides a fair presentation of the issues on the topic, and hope that it succeeds in focussing the ongoing discussions on the question of ethanol.

From our perspective, we believe that the paragraph dealing with regional and provincial considerations in Saskatchewan does not fully consider the current structure of our energy environment. We see no direct conflict between the use of oxygenated gasolines and the upgrading of heavy oil.

Furthermore, the use of oxygenates by themselves will not significantly reduce the demand for conventional gasoline, and therefore we do not see any direct effect on the desirability of upgrading heavy oils. From another viewpoint, since Saskatchewan is not self-sufficient in refined products, if any is replaced with oxygenates sourced from this province this would largely be import displacement. We also wish to point out that your argument for some volume of oxygenates backing out production of heavy oil seems to imply the use of oxygenates as a gasoline extender; we believe that the future role for these products will be as octane enhancers, and volumetric displacement will not be the significant issue.

A second concept expressed in the Paper as it relates to Saskatchewan's considerations seems to indicate that unless a province can conceivably produce methanol, TBA, IBA, IPA, or MTBE, oxygenated fuels are of little interest. This logic is not evident, and this government believes that ethanol has value as an oxygenate and potentially as a co-solvent with Alberta methanol for a competitively-priced gasoline product.

Finally, we must consider the specific energy-related issues that your Paper so well defines in association with other issues existing in the province. In this context the Government has, and continues, to believe that the production of ethanol can both diversify our agricultural sector and contribute to further economic development. We feel that your Paper will assist not only in the national discussion of oxygenate issues, but also in our own internal evaluation of the topic.

Yours truly,

Rick Horocholyn,
Senior Financial Advisor

cc Kim Graybiel,
Policy Secretariat
Executive Council

Dan McFadyen, Director
Energy & Mines

bcc Andree Sheehan,
Energy & Resource Policy Division
Department of Finance
Ottawa

Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

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British Columbia
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May 13, 1987

Mr. Roy Sage, Director
Policy Analysis
Transportation Energy Branch
Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4

Dear Mr. ~~Sage~~ Roy:

Thank you for sending a copy of EMR's "Discussion Paper on Oxygenated Gasolines". I found it comprehensive and useful in placing oxygenates in proper perspective.

One of the paper's most important conclusions is that widespread adoption of oxygenates has a limited "window of opportunity" before refiners seek alternate options to meet the 1993 lead phasedown target. The ethanol facility planned for Dawson Creek is scheduled to come on-stream in 1988 and this is likely well timed to impact refinery planning.

The Dawson Creek plant must be regarded primarily as an economic development/agricultural assistance initiative with a subsidiary benefit of displacing gasoline with indigenous fuel. Support for agriculture through diversification of grain markets is the distinctive characteristic which supplies urgency to this project rather than the pull of fuel ethanol requirements. Today's depressed grain prices, which have dropped 38 percent in the last year, provide a feedstock priced at about 75 percent of that used in the Discusssion Paper example. Ethanol costs are at the lower end of the $\$350-\$450/M^3$ range as a result. Even at that level, the cost would be above the ethanol fuel breakeven value, indicating a fuel use subsidy is required. The Government included in the 1987 Budget provision for setting the provincial tax on gasoline mixed with ethanol at 2¢/litre below the appropriate gasoline tax rate, effective upon completion of the ethanol production facility. This provides a subsidy of 20¢/litre of ethanol, moving the net cost below the breakeven value. This should prove attractive to the refiner and serve to introduce ethanol through

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the "window of opportunity". Continued emphasis will be required, however, on those developments which are aimed at lowering ethanol production costs over the longer term when grain prices can be expected to recover.

I look forward to further dialogue with you on oxygenated gasoline developments.

Yours sincerely,

L.J. Schofield
Senior Policy Advisor
Policy Development Branch
Energy Resources Division

LJS/tw

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Telephone: 232-3111

May 29, 1987

Energy, Mines and Resources
Ottawa, Ontario
K1A 0E4

Attention: Director, Policy Analysis,
Transportation/Energy Branch

Dear Mr. Sage

RE: DISCUSSION PAPER ON OXYGENATED GASOLINES, 1986
YOUR REFERENCE CN 8365-7-4

Thank you for the opportunity to comment on the "Discussion Paper on Oxygenated Gasolines, 1986". The paper is, in our opinion, a fair statement of the current technical considerations. We do have five points where we are at issue with the paper:

1. Your "least-cost computer model of a typical refinery" gives a much more optimistic picture of the economics of oxygenated gasolines than our LP model does. In fact our models indicate that additional refinery processing is a more economic way of producing the needed octane.

2. We disagree that an oxygenated gasoline industry would have no effect on the petroleum industry. Our studies indicate that if oxygenates were a significant proportion of the gasoline pool it would result in the closure of a 50000 bbl/day refinery.

3. We consider the impact on employment (pp 71-76) to be severely inflated. For example, only 315 jobs are created at seventeen ethanol plants but 4529 jobs are created in off-site, indirect and induced ways. It is difficult to imagine where these jobs would be created.

4. The consumer factors (pp. 82-83) severely under-estimate potential customer concerns. In the oil products business, as in most businesses, the needs of the customer are paramount and the suggestion that a fuel that gives poorer driveability, poorer fuel economy and that is not fully acceptable to vehicle manufacturers can compete at equal price is difficult to accept.

Shell Canada's view on oxygenated gasolines was expressed in a brief to the Standing Committee on National Resources and Public Works in January 1986. A copy of our brief to this Committee is attached. Our views have not changed in the last eighteen months. Technical issues still need to be resolved and we endorse the May 1986 recommendation of the Standing Committee that calls for the Federal Government to support research, development and demonstration programmes to address these issues.

If you have any questions or if you wish to discuss further do not hesitate to call us.

Yours very truly

P. Gadbois
Manager - Supply & Planning

Attachment

BRIEF

TO THE STANDING COMMITTEE ON

NATIONAL RESOURCES AND PUBLIC WORKS

THE USE OF ALCOHOLS AS GASOLINE BLENDING COMPONENTS

SHELL CANADA LIMITED

December 19, 1985

SUMMARY AND RECOMMENDATIONS

Shell are continually looking for ways to meet the fuel needs of customers at competitive prices, so we welcome the standing committee's study of the feasibility of using alcohols as gasoline components.

Shell have devoted significant effort to understand the potential of alcohol/gasoline blends and have developed considerable experience in their use. We have been actively co-operating with the Government departments - both Federal and Provincial - that are active in evaluating these alternate fuels.

Based on this experience, we consider there are several issues that remain to be resolved before methanol/co-solvent/gasoline blends could become a long-term viable fuel option in Canada. (Details of these issues are laid out in the Attachment.)

1. Environmental Issues: The control of the evaporation of gasoline into the environment is currently being studied. The evaporative emissions would be affected by the inclusion of methanol/ethanol in gasoline.

2. Technical Issues: The transport of gasolines containing methanol through common-carrier pipelines is of particular concern.

3. Co-solvent availability and price in Canada : There is insufficient supply of co-solvent in Canada for extensive use of methanol in gasoline. The establishment of a co-solvent industry in Canada would require it to be price-competitive with co-solvent produced overseas if the industry was to be viable in the long-term and not liable to the threat of cheap imports.

4. Octane Generating Capacity: Other methods to increase octane generating capacity, other than use of alcohols, exist and these should be studied. Our analysis indicates that refinery processing options are more cost-effective for the consumer at the 1987 legislated limit of 0.29 g/l lead.

5. Fungibility Issues: The need for fungible gasolines that can be exchanged and traded by oil companies has been necessitated by decreased demand for gasoline and by refinery closures. The ability of gasolines containing methanol to be compatible with the fungible gasoline in a cost-competitive way renains an outstanding issue.

Considering these unresolved issues, our recommendations are:

(1) The co-operative effort between industry, EM&R and other government departments aimed at understanding the specifically Canadian aspects of the use of alcohols in gasoline should continue. Issues such as cold weather effects, pipelining, marine shipments, epoxy-tank susceptibility, fungibility, co-solvent availability and cost, environmental impact on air and water quality require solid answers. PACE and CGSB should also be encouraged to continue their work.

(2) Artificial incentives (eg. tax or duty rebates) to encourage the use of alcohols should be avoided. If the driving force is the social benefits of increased employment in the methanol and/or ethanol businesses then it must be remembered that these are offset by adverse social effects of decreased employment in the oil refining business.

(3) With the coming of lead phase-down, oxygenates should continue to be studied with the view to implementation if, and when, they are definitively proven to be economically viable, assuming, of course, the above issues are satisfactorily resolved.

ATTACHMENT

UNRESOLVED ISSUES CONCERNING THE USE OF ALCOHOLS IN GASOLINE

1. Environmental Issues

(a) Lead and MMT

Lead in gasoline is being studied by the HARE Commission as part of a larger investigation of Lead in the Environment. Shell - through PACE - have submitted evidence to this commission.

Interim findings of the commission indicate:

- current lead phase-down schedules are sufficient to protect the environment,
- use of leaded fuel in vehicles intended for use with non-leaded fuels (misfuelling) should be stopped.

Shell agree with these conclusions.

The use of MMT in gasoline as an octane booster is not generally considered to be an environmental hazard. Strict rules are imposed in the handling of MMT.

The effect of MMT on gaseous emissions - especially hydro-carbons - is under review by a sub-committee of the Canadian General Standards Board (CGSB). Preliminary indications are that MMT does not have a detrimental effect on environmental emissions.

In summary, both lead and MMT in gasoline are under review by professional groups and the proposals of these groups should be awaited.

(b) Alcohols

The use of alcohols in gasoline - especially methanol and ethanol - has two potential effects, it raises the vapour pressure of the gasoline and it changes the type of gaseous emissions from the automobile tail-pipe.

Firstly, the increase in Reid vapour pressure (RVP) of the gasoline is compensated by removing butane. However, there are indications in the USA that a reduction in the RVP would limit evaporative emissions. These emissions of so-called volatile organic chemicals (VOC) have been implicated in the production of ozone. To limit VOC it is proposed to reduce RVP by reducing butanes. The standards would not permit the use of methanol/ethanol without large-scale changes in refinery operation (reduction of pentanes).

Secondly, the combustion of alcohols in gasoline can produce aldehydes. These trace amounts of aldehydes -including formaldehyde - could be more harmful to the environment than the hydrocarbons emissions formed from alcohol-free gasoline.

These issues are still the subject of research and are not resolved, but they do show that an alcohol blend in gasoline may not produce an "environmentally safe" fuel, but rather substitute one set of emissions for another.

Shell encourage the continued study of emissions from alcohol-containing fuels.

2. Octane Generating Capacity

Alcohols are only one way of increasing octane generating capacity.

The legislated phase-down of lead in gasoline, effective January 1, 1987, has led to considerable analysis of refinery requirements to produce octane.

Our analysis for Shell refineries indicates that processing options are more cost effective in meeting the 1987 legislated limit of 0.29 g lead/litre.

Only in the case where lead and MMT additions are totally banned from gasoline does the use of alcohols offer a cost-effective method of providing the needed octane. Our calculations, in common with all others, are dependent of the price of alcohols, the ratio of methanol to co-solvent (see later; Item 3), the value of butane displaced from the gasoline pool and the satisfactory resolution of the fungibility issue without a cost penalty (see later; Item 5).

In summary, the use of alcohols is only one of many ways of increasing octane capability, and the best solution depends on specific refinery configuration.

3. Technical Issues

Methanol/co-solvent blends have been marketed in Germany and Austria (where Shell have been active in their evaluation and sale) and in the U.S.A. However, we consider there are some specifically Canadian aspects of the use of methanol/co-solvent blends in gasoline.

(a) Blend Stability

Methanol/gasoline mixtures are sensitive to water. Water can wash the methanol from the blend and thereby cause a loss of octane. The use of co-solvent inhibits this process. Ethanol is the worst co-solvent as it is also soluble in water. Higher alcohols like isopropanol, isobutanol and tertiary butanol are better solvents. The more co-solvent with the methanol in the gasoline blend, the less the sensitivity to water. Unfortunately, this is opposite to the requirements for economic viability because methanol is the cheaper component and the co-solvent - especially ethanol - is the expensive component.

Shell endorse the CGSB work on setting specification standards for methanol/co-solvent blends that are stable and handleable in the Canadian market.

The best way to ensure that a methanol/ethanol/gasoline blend is stable - especially using 5% methanol and 3% ethanol - is to avoid contact with water. This is relatively easy in simple distribution systems using dedicated truck delivery and relatively few service stations.

It is not straightforward to scale up the use of methanol in gasoline to the Canadian system because the fuel distribution systems are complex using pipelines, ships and rail-cars as well as trucks. Much of the Canadian distribution system is used to deliver other oil products as well as gasoline and the practical realities are that it is almost virtually impossible to keep the distribution systems dry.

The Canadian situation differs from the German, Austrian and U.S. systems used to handle methanol-blends since it would rely heavily on common-carrier pipelines.

We consider there has been insufficient work on the Canadian aspects of handling and storage of alcohol blends, and we encourage increased work in this area.

(b) Material Compatibility

Methanol/co-solvent gasolines are not compatible with all materials and can cause problems with elastomers and metal corrosion.

Of particular concern is compatibility with epoxy-lined fuel storage tanks. Canada has many thousand such tanks that have been installed over the years (Epoxy tanks are not legal in Germany and Austria). Although newly produced epoxy tanks are manufactured to be compatible with methanol blends, there is no such guarantee with older tanks in the ground. Work is underway, under the auspices of PACE, to evaluate the compatibility of a full range of epoxy linings - both old and new - with methanol-gasoline blends.

Canadian motor manufacturers have expressed concerns about the long-term compatibility of auto-part materials with methanol. We understand they are conducting their own tests.

4. The Availability and Cost of Co-solvent for Methanol Blends

The domestic Canadian methanol industry is capable of producing about 2.2 billion litres for fuel use. This is equivalent to about 5% of the total gasoline demand.

The current supply situation of co-solvents in Canada is much more restricted.

IPA is produced by Shell in Sarnia and up to 50 million litres per year could be produced for use in gasoline, assuming that the price was acceptable. This is sufficient for a 5% co-solvent treatment of about 8% of the Ontario gasoline sales.

Ethanol is also currently available in comparable amounts (approx. 80 million per year).

TBA is not manufactured in Canada.

For methanol to become a significant factor in the gasoline market, i.e. if it is to make the transition from independent regional fuel marketers to the majors, a substantial additional volume of co-solvent would be required.

In the short term this could be met by imports. In the long-term a new co-solvent industry, like ethanol, could be established. This industry would need to be price-competitive with off-shore production of co-solvent in order to produce the long-term economic benefits for Canada cited in the Private Members Bill. Otherwise co-solvent imports would be attracted to Canada.

The alternative, tax incentives or other artificial support of co-solvent business is potentially very expensive.

If the strategy of developing a government-supported co-solvent industry was attained it would be achieved at the expense of refinery jobs lost because of refinery rationalization due to reduced demand for conventional gasoline.

5. Fungibility

In recent years, the decreased demand for oil products - especially gasoline - has led to the closure of twelve refineries. This fact, coupled with the vastness of Canada, has led to oil companies entering into supply, exchange and process agreements in order to market efficiently in all areas of the country. Consequently, although each oil company has its own specifications for gasoline, there has been a need for fungible gasolines - gasolines that can be traded.

There is insufficient storage capacity to stock both gasoline free of methanol (for exchange partners) and gasoline with methanol (for sale).

For companies with both refining and marketing operations, it is difficult to produce methanol/gasoline blends until this fungibility issue has been resolved.

W V Boyles
Director
Engineering and
Technical Services
Refining Department

Texaco Canada Inc.

1210 Sheppard Avenue East
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North York Ont M2K 2S5

May 21, 1987

Mr. Roy Sage
Director, Policy Analysis
Transportation Energy Branch
Energy, Mines & Resources Canada
460 O'Connor St.
Ottawa, Ont. K1S 5H3

Dear Mr. Sage:

We would like to thank you for forwarding to us a copy of the EMR Discussion Paper on Oxygenated Gasolines, in addition to the report entitled "Optimization Linear Program Analysis of Oxygenated Fuels on Canadian Oil Refineries".

Having been involved in the preliminary discussions pertaining to the draft report, we were pleased to see some of our input contained in the final report. In particular, you have clearly indicated that there are a number of questions to be resolved with respect to evaporative emissions during blending and distribution of oxygenated gasolines, evaporative emissions from vehicles, exhaust emissions from vehicles and the occupational health aspects of handling oxygenated fuels.

We feel that the paper presents a balanced evaluation of the advantages and disadvantages of oxygenated fuels and that the paper is a valuable resource document.

Yours very truly,

W V Boyles

PDM:jt

cc: JLM

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DONALD F MacLAUCHLAN
Vice President

DEVELOPMENT DEPARTMENT

June 4, 1987

Mr. Roy Sage, Director,
Policy Analysis,
Transportation Energy Branch
Energy, Mines & Resources of Canada
580 Booth Street
Ottawa, Ontario
K1A0E4

Dear Roy:

I am writing in response to your recent request for comments on the EM&R Discussion Paper on Oxygenated Gasolines. Let me start by congratulating you on the high quality and comprehensive nature of this report. It is clear that you have thoroughly examined the topic of oxygenated gasolines, and understand, not only the technical aspects, but also the concerns and viewpoints of the various interested parties.

As you know, we have also looked closely at oxygenates as sources of octane for gasolines. We recently reviewed our position on oxygenates, and confirmed the following key points:

- MTBE is technically the most attractive oxygenate to use in blending gasolines.
- Alcohol/gasoline blends will not provide the same level of customer satisfaction as our normal gasolines.
- The opposition of some vehicle manufacturers to the use of methanol in gasoline is a concern to us.
- Compatibility and costs of distributing alcohol/gasoline blends is an issue, because of the variety of transportation modes and the length of Canadian gasoline distribution systems.
- In our refineries, alcohols would be more costly than other octane sources (even using the lowest reasonable alcohol prices) at current crude oil and product values.

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In view of the above issues, we continue to believe that alcohol/gasoline blends are not a suitable product for Esso to market at this time. We are not opposed to alcohol/gasoline blends, we are continuing to assess the opportunity as circumstances change and as technical difficulties are resolved, and we support further research and evaluation by all parties.

Let me now turn to some specific comments on the discussion paper. In the attachment, I have organized these comments, using the same section numbers as you used in your report. You may also wish to review the comments we provided in response to the November 1985 draft of this discussion paper.

I hope that our comments will be useful to you, and provide some additional information. If it would be helpful to discuss some issues in more detail, please let me know, and we can arrange a meeting.

In closing, congratulations again to you and your colleagues on some excellent work in assessing oxygenated gasolines. I look forward to continuing to work with you on this topic and on other alternative fuels subjects when appropriate.

Very truly yours,

K.C. Bushell

K.C. Bushell
Senior Planner,
Fuel Products Technology

L70.KCB/ah

ATTACHMENT

COMMENTS ON EM&R DISCUSSION PAPER ON OXYGENATED GASOLINES

3.4.1 Driveability

The last paragraph in this section comments on the difficulty in determining when alcohol blend driveability would be "acceptable or not". The difficulty arises because of the need to assess such factors as competitive position, market strategy, product quality standards, etc. For Esso, we believe that our fleet test in Sarnia demonstrated sufficiently poor driveability to be a concern to us.

4.0 Environmental Health and Safety Effects

This section identifies a number of items requiring further assessment or development of appropriate data. As energy values increase and various technical/performance concerns are resolved, there may well come a point when oxygenated gasolines can provide adequate benefits to sustain the product on an ongoing basis. We therefore support suitable research to understand and resolve any environmental safety and health concerns.

4.1.3 Blending, Distribution, and Sale of Oxygenated Gasolines

In regard to spills of oxygenated gasolines, some concerns were recently expressed in the State of Maine with regard to MTBE. The issue appears to be whether the MTBE is causing an increase in the solubility of gasoline hydrocarbons in water. If this concern proves valid, it will likely also be true for alcohol/gasoline blends. Various agencies in the United States are beginning work on these issues.

6.0 Refinery Analysis

In addition to simply installing additional process unit capacity in the form of isomerization units or reformers, the capacity of existing cat cracking and reformer units can be improved through catalyst changes. The catalyst manufacturers appear to be making major progress in this regard, and this will assist the industry in meeting the additional octane requirements arising from lead phase-down.

A few weeks ago, you called to discuss some industry costs which you had seen expressed on an octane barrel basis. I thought that it might be helpful to calculate such costs using the information in the discussion paper, and these are attached. These costs include the cost of the oxygenates giving the octane increase, and the cost of any butane which must be removed from the blend, as a result of using the oxygenates. The blending values for octane and RVP are taken from Table 6.4, and the representative oxygenate costs from Table 6.1.3. I also needed a value for unleaded regular gasoline, and I used a number from the Hycarb report to EM&R, which was subsequently published as your Report #TE-86-5.

.../2

To provide some perspective on these numbers, ARCO recently published some estimates of the variable costs of octane from conventional refining processes, giving a range of 35 to 50¢/octane barrel. This would make the IPA methanol and the MTBE cases attractive, based on the assumptions made. However, the costs in the discussion paper for both MTBE and for IPA appear to be low, relative to normal market prices.

7.5 Sensitivity Analysis of Net Economic Benefits

The paragraph at the bottom of Page 69 refers to MTBE backing out more crude oil than do the other oxygenates. It is difficult to understand why this should happen, since the octanes of MTBE were equivalent to those of methanol/TBA, and lower than the other oxygenates. Part of this effect may be due to the MTBE allowing more butane to be added to the gasoline, rather than less. The relatively lov cost of the MTBE (compared to normal market conditions) may also be contributing, by making it more economic for the linear program to purchase MTBE and back down on crude processing.

In any case, this section demonstrates clearly the high sensitivity of the economic benefits to the costs of the oxygenates and of crude oil. Because of this sensitivity, refiners would be attracted to oxygenates only they perceive that benefits are available over the normal range of market conditions.

8.0 Employment Impact Analysis

As we have noted before, this section would be strengthened considerably, if it had also included the employment impacts of reformer upgrading and isomerization units. Since both the least cost refinery analysis and the social cost benefit analysis included the impacts of these units, covering these options here would provide consistent treatment throughout the discussion paper.

10.0 Consumer Factors

Articles in the trade and public press indicate that consumer acceptance of oxygenated gasolines (particularly alcohols) is an issue for anyone marketing such fuels. Some adverse publicity has clearly arisen from poor blending practices by some marketers. However, our own data and other public reports indicate that some cars do have driveability problems with alcohol/gasoline blends. This deterioration in vehicle performance is another likely cause of some of the expressed consumer concerns.

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11.5 The Window of Opportunity

In the case of MTBE, there are some additional possibilities with regard to its production in Canada. Experience in the United States indicates that some refineries may have, or be able to, easily make sufficient butylenes to support a small MTBE plant. Secondly, MTBE is one of the fastest growing (perhaps the fastest growing) industrial chemicals currently being sold. This raises the possibility of world-scale plants in Canada, targeting not only the Canadian market, but also the United States and Europe. The recent announcement about the feasibility study in Alberta by Celanese and others underlines this possibility. It is interesting to note that some trade publications are referring to the MTBE as the "oxygenate of choice" by the petroleum industry.

A70.KCB/ah
June 5, 1987

CTANE-BBL COSTS for EM&R DISCUSSION PAPER

LOW OXYGENATE COSTS		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
NL'D REG'R	90.5%	94.0	89.0	905	0.271	245.255
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)	9.5%	228.0	108.0	95	0.208	19.76
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.230	0
MeOH-TBA (5-3)		290.0	109.5	0	0.185	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.203	0
Ethanol (10)		138.0	118.0	0	0.350	0
MTBE (11)		62.0	108.0	0	0.285	0
OXY'D BLEND	100%	106.7	90.8	1000	0.265	265.02
BUTANE (Value @ $ 161/m3)		413.7	92.0	-40	-0.110	4.38
NET PRODUCT		94.0	90.8	960	0.281	269.40
PRODUCT COST INCREASES BY (Cents/L)				0.96		
OCTANE INCREASES BY ((R+M)/2 Octanes)				1.8		
UNIT COST ($/Octane-Bbl)				0.87		

HIGH COST OXYGENATES		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
NL'D REG'R	90.5%	94.0	89.0	905	0.271	245.255
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)	9.5%	228.0	108.0	95	0.247	23.465
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.269	0
MeOH-TBA (5-3)		290.0	109.5	0	0.233	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.289	0
Ethanol (10)		138.0	118.0	0	0.450	0
MTBE (11)		62.0	108.0	0	0.375	0
OXY'D BLEND	100%	106.7	90.8	1000	0.269	268.72
BUTANE (Value @ $ 161/m3)		413.7	92.0	-40	-0.110	4.38
NET PRODUCT		94.0	90.8	960	0.284	273.10
PRODUCT COST INCREASES BY (Cents/L)				1.34		
OCTANE INCREASES BY ((R+M)/2 Octanes)				1.8		
UNIT COST ($/Octane-Bbl)				1.22		

OCTANE-BBL COSTS for EM&R DISCUSSION PAPER

LOW OXYGENATE COSTS		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	90.5%	94.0	89.0	905	0.271	245.255
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.208	0
MeOH-IPA (4.75-4.75)	9.5%	179.0	112.0	95	0.230	21.85
MeOH-TBA (5-3)		290.0	109.5	0	0.185	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.203	0
Ethanol (10)		138.0	118.0	0	0.350	0
MTBE (11)		62.0	108.0	0	0.285	0
OXY'D BLEND	100%	102.1	91.2	1000	0.267	267.11
BUTANE (Value @ $ 161/m3)		413.7	92.0	-25	-0.110	2.78
NET PRODUCT		94.0	91.2	975	0.277	269.88
PRODUCT COST INCREASES BY (Cents/L)				0.59		
OCTANE INCREASES BY ((R+M)/2 Octanes)				2.2		
UNIT COST ($/Octane-Bbl)				0.43		

HIGH COST OXYGENATES		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	90.5%	94.0	89.0	905	0.271	245.255
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.247	0
MeOH-IPA (4.75-4.75)	9.5%	179.0	112.0	95	0.269	25.555
MeOH-TBA (5-3)		290.0	109.5	0	0.233	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.289	0
Ethanol (10)		138.0	118.0	0	0.450	0
MTBE (11)		62.0	108.0	0	0.375	0
OXY'D BLEND	100%	102.1	91.2	1000	0.271	270.81
BUTANE (Value @ $ 161/m3)		413.7	92.0	-25	-0.110	2.78
NET PRODUCT		94.0	91.2	975	0.281	273.59
PRODUCT COST INCREASES BY (Cents/L)				0.97		
OCTANE INCREASES BY ((R+M)/2 Octanes)				2.2		
UNIT COST ($/Octane-Bbl)				0.71		

OCTANE-BBL COSTS for EM&R DISCUSSION PAPER

LOW OXYGENATE COSTS		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	92.0%	94.0	89.0	920	0.271	249.32
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.208	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.230	0
MeOH-TBA (5-3)	8.0%	290.0	109.5	80	0.185	14.8
MeOH-EtOH (5-3)		255.0	112.0	0	0.203	0
Ethanol (10)		138.0	118.0	0	0.350	0
MTBE (11)		62.0	108.0	0	0.285	0
OXY'D BLEND	100%	109.7	90.6	1000	0.264	264.12
BUTANE (Value @ $ 161/m3)		413.7	92.0	-49	-0.110	5.40
NET PRODUCT		94.0	90.6	951	0.283	269.52
PRODUCT COST INCREASES BY (Cents/L)				1.24		
OCTANE INCREASES BY ((R+M)/2 Octanes)				1.6		
UNIT COST ($/Octane-Bbl)				1.26		

HIGH COST OXYGENATES		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	92.0%	94.0	89.0	920	0.271	249.32
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.247	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.269	0
MeOH-TBA (5-3)	8.0%	290.0	109.5	80	0.233	18.64
MeOH-EtOH (5-3)		255.0	112.0	0	0.289	0
Ethanol (10)		138.0	118.0	0	0.450	0
MTBE (11)		62.0	108.0	0	0.375	0
OXY'D BLEND	100%	109.7	90.6	1000	0.268	267.96
BUTANE (Value @ $ 161/m3)		413.7	92.0	-49	-0.110	5.40
NET PRODUCT		94.0	90.6	951	0.287	273.36
PRODUCT COST INCREASES BY (Cents/L)				1.65		
OCTANE INCREASES BY ((R+M)/2 Octanes)				1.6		
UNIT COST ($/Octane-Bbl)				1.67		

OCTANE-BBL COSTS for EMER DISCUSSION PAPER

LOW OXYGENATE COSTS		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	92.0%	94.0	89.0	920	0.271	249.32
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.208	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.230	0
MeOH-TBA (5-3)		290.0	109.5	0	0.185	0
MeOH-EtOH (5-3)	8.0%	255.0	112.0	80	0.203	16.24
Ethanol (10)		138.0	118.0	0	0.350	0
MTBE (11)		62.0	108.0	0	0.285	0
OXY'D BLEND	100%	106.9	90.8	1000	0.266	265.56
BUTANE (Value @ $ 161/m3)		413.7	92.0	-40	-0.110	4.43
NET PRODUCT		94.0	90.8	960	0.281	269.99
PRODUCT COST INCREASES BY (Cents/L)				1.03		
OCTANE INCREASES BY ((R+M)/2 Octanes)				1.8		
UNIT COST ($/Octane-Bbl)				0.92		

HIGH COST OXYGENATES		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	92.0%	94.0	89.0	920	0.271	249.32
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.247	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.269	0
MeOH-TBA (5-3)		290.0	109.5	0	0.233	0
MeOH-EtOH (5-3)	8.0%	255.0	112.0	80	0.289	23.12
Ethanol (10)		138.0	118.0	0	0.450	0
MTBE (11)		62.0	108.0	0	0.375	0
OXY'D BLEND	100%	106.9	90.8	1000	0.272	272.44
BUTANE (Value @ $ 161/m3)		413.7	92.0	-40	-0.110	4.43
NET PRODUCT		94.0	90.8	960	0.288	276.87
PRODUCT COST INCREASES BY (Cents/L)				1.75		
OCTANE INCREASES BY ((R+M)/2 Octanes)				1.8		
UNIT COST ($/Octane-Bbl)				1.55		

OCTANE-BBL COSTS for EM&R DISCUSSION PAPER

LOW OXYGENATE COSTS		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	90.0%	94.0	89.0	900	0.271	243.9
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.208	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.230	0
MeOH-TBA (5-3)		290.0	109.5	0	0.185	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.203	0
Ethanol (10)	10.0%	138.0	118.0	100	0.350	35
MTBE (11)		62.0	108.0	0	0.285	0
OXY'D BLEND	100%	98.4	91.9	1000	0.279	278.90
BUTANE (Value @ $ 161/m3)		413.7	92.0	-14	-0.110	1.51
NET PRODUCT		94.0	91.9	986	0.284	280.41
PRODUCT COST INCREASES BY (Cents/L)				1.33		
OCTANE INCREASES BY ((R+M)/2 Octanes)				2.9		
UNIT COST ($/Octane-Bbl)				0.73		

HIGH COST OXYGENATES		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	90.0%	94.0	89.0	900	0.271	243.9
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.247	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.269	0
MeOH-TBA (5-3)		290.0	109.5	0	0.233	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.289	0
Ethanol (10)	10.0%	138.0	118.0	100	0.450	45
MTBE (11)		62.0	108.0	0	0.375	0
OXY'D BLEND	100%	98.4	91.9	1000	0.289	288.90
BUTANE (Value @ $ 161/m3)		413.7	92.0	-14	-0.110	1.51
NET PRODUCT		94.0	91.9	986	0.294	290.41
PRODUCT COST INCREASES BY (Cents/L)				2.35		
OCTANE INCREASES BY ((R+M)/2 Octanes)				2.9		
UNIT COST ($/Octane-Bbl)				1.29		

OCTANE-BBL COSTS for EM&R DISCUSSION PAPER

LOW OXYGENATE COSTS		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	89.0%	94.0	89.0	890	0.271	241.19
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.208	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.230	0
MeOH-TBA (5-3)		290.0	109.5	0	0.185	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.203	0
Ethanol (10)		138.0	118.0	0	0.350	0
MTBE (11)	11.0%	62.0	108.0	110	0.285	31.35
OXY'D BLEND	100%	90.5	91.1	1000	0.273	272.54
BUTANE (Value @ $ 161/m3)		413.7	92.0	11	-0.110	-1.21
NET PRODUCT		94.0	91.1	1011	0.268	271.33
PRODUCT COST INCREASES BY (Cents/L)				-0.26		
OCTANE INCREASES BY ((R+M)/2 Octanes)				2.1		
UNIT COST ($/Octane-Bbl)				-0.20		

HIGH COST OXYGENATES		BLENDG RVP (PSIA)	BLENDG OCTANE (R+M)/2	VOLUME (L)	UNIT VALUE ($/L)	COST IMPACT ($)
UNL'D REG'R	89.0%	94.0	89.0	890	0.271	241.19
OXYGENATES (%)						
MeOH-TBA (4.75-4.75)		228.0	108.0	0	0.247	0
MeOH-IPA (4.75-4.75)		179.0	112.0	0	0.269	0
MeOH-TBA (5-3)		290.0	109.5	0	0.233	0
MeOH-EtOH (5-3)		255.0	112.0	0	0.289	0
Ethanol (10)		138.0	118.0	0	0.450	0
MTBE (11)	11.0%	62.0	108.0	110	0.375	41.25
OXY'D BLEND	100%	90.5	91.1	1000	0.282	282.44
BUTANE (Value @ $ 161/m3)		413.7	92.0	11	-0.110	-1.21
NET PRODUCT		94.0	91.1	1011	0.278	281.23
PRODUCT COST INCREASES BY (Cents/L)				0.72		
OCTANE INCREASES BY ((R+M)/2 Octanes)				2.1		
UNIT COST ($/Octane-Bbl)				0.54		

MOHAWK OIL CO. LTD.

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July 24, 1987

Energy Mines & Resources Canada
Ottawa, Ontario
K1A 0E4

Attention: Mr. Michel Falardeau
Senior Economist
Transportation Energy Branch

Dear Mr. Falardeau:

Mohawk Oil Co. Ltd.'s comments to your discussion paper were an attempt to provide you with the benefit of our experience with oxygenated gasoline. We don't, believe that some of the comments should be in the public domain and accordingly we ask you not to publish our response in an annex to your report. You are of course free to summarize our position and we would be willing to review your summary to insure it contained the essence of our position.

Yours very truly,

MOHAWK OIL CO. LTD.

Don O'Connor, P. Eng.
General Manager,
Alcohol Fuels Division

DOC/cs

DOC#9

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87-04-29

PETRO-CANADA

Mr. R. Sage
Director, Policy Analysis
Transportation Energy Branch
Energy Mines and Resources Canada
Ottawa, Canada
K1A 0E4

Dear Mr. Sage,

In reply to your request of March 10, 1987 I am pleased, on behalf of Petro-Canada, to enclose a response to the 1986 Discussion Paper on Oxygenated Gasolines published by Energy, Mines and Resources.

As you are aware from our previous submissions on this topic, Petro-Canada for several years has conducted research into the technical and economic feasibility of adding oxygenates to gasolines. Based on the resulting knowledge, we have concluded that there are significant hurdles to be overcome before the oxygenates in general and the lighter alcohols in particular can be introduced into the gasoline fuels market on a widespread basis.

It is our view that while oxygenates may have a role to play in transportation fuels, the decision to introduce them must be made on an individual basis by the manufacturer or marketer concerned. Any government program designed to encourage the use of oxygenates which would otherwise not be economically viable will ultimately be to the detriment of the industry and our customers.

We would be pleased to meet with officials of EMR to expand on the comments contained in our attached report if you should so desire or if we may provide any related additional information which would be helpful to your study.

Yours truly,

R.S. Vincent
Vice-President, Refining & Technology
Petro-Canada Products

A division of Petro-Canada Inc.

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PETRO-CANADA INC.

SUBMISSION

TO THE

TRANSPORTATION ENERGY BRANCH

OF

ENERGY, MINES, AND RESOURCES

on the Role of Oxygenates in Gasoline

Comments on the 1986 Discussion Paper

Introduction and Highlights

Petro-Canada is pleased to make this submission outlining our views on the use of oxygenates in gasolines in Canada.

Over the past several years, Petro-Canada has actively investigated the opportunities associated with the use of oxygenates in gasoline, both as a fuel extender and as a high octane blending component. This involvement has allowed us to develop an understanding of the technical and economic barriers which must be overcome before the use of oxygenates becomes widespread in Canada.

For the purposes of this submission, we have limited the discussion of oxygenates employed in gasoline blending to methanol, methanol/cosolvent, ethanol, and MTBE (methyl tertiary butyl ether). Price and availability of the heavier alcohols and ethers significantly restrict their availability for gasoline blending.

As a general statement, the blending of MTBE in gasoline generates minimal technical concerns since the material is very similar and compatible to gasoline components currently utilized. The major factor limiting the use of MTBE is economics. For MTBE to achieve significant market penetration, its price must be competitive with the cost of other, conventionally generated octane sources. Alcohols, primarily light alcohols, however, in addition to the economic barrier, have numerous technical, environmental and quality concerns which must be addressed before alcohol/gasoline blends can be successfully introduced into the marketplace on a widespread basis.

Although alcohols are high octane blending components, their high RVP significantly reduces the quantity of another high octane blend component, butane, allowed in the blend. As a result, refiners will still be required to make large capital expenditures to meet the lead phaseout octane requirements.

Petro-Canada believes that in the long run, the utilization of oxygenates in gasoline are best managed through a reliance on the workings of market forces. The petroleum refining industry is well aware of the oxygenate potential, and will utilize them when economically justified. Governmental policies which foster premature utilization could result in a net loss of jobs and a non-economic industry requiring long term support.

Key Observations and Conclusions

1. The employment of MTBE and other similar ethers is limited only by economics. The technical issues arising from its use are minimal and can be readily addressed.

2. The widespread use of alcohols in gasoline is not only limited by economics but by significant technical and quality issues.

3. The full utilization of oxygenates in gasoline will add significantly to the surplus of refining capacity already present in Canada. This could result in a net decrease in jobs.

4. The full utilization of alcohols would significantly reduce the quantity of butane blended into gasoline. This would result in an increase in the current surplus of butanes in the NGL market. MTBE, which would employ butane as a feedstock, would not impact upon the current butane supply/demand balance.

5. The utilization of alcohols in gasoline will have minimal impact on the requirement for octane facility investment as the use of alcohols significantly reduces the quantity of butane, another high octane component, allowed in the blend.

6. The use of alcohols in gasolines can result in a more significant impact on the environment in the case of a gasoline spill. Alcohols are water soluble and will be preferentially carried into ground water. Their presence in the ground water also increases the solubility of gasoline and will make any spill significantly harder to contain and clean up.

Role of Oxygenates in Gasoline

Barriers to Utilization - A Summary

Impact on Customer Satisfaction

Customer satisfaction is of paramount importance in today's highly competitive marketplace. Two important facets in achieving customer satisfaction are the performance of the product and the customer's perception of the quality of the product. Although these are normally closely related, this is not necessarily the case.

To ensure satisfactory performance of its gasoline, Petro-Canada manufactures it to rigid specifications. Our customer have come to expect a high quality, trouble free product. Our research indicates that the use of oxygenates, primarily the lighter alcohols, would result in a decline in gasoline performance. (See Impact on Product Quality)

The use of oxygenates in the USA has been quite extensive. The major oxygenates used have been MTBE, ethanol, and methanol/cosolvent blends. The last two have been marketed under the generic name of gasohol. Gasohols over the last while have developed a low quality image in the USA. This has resulted in three major suppliers recently withdrawing from the marketplace. It is reasonable to assume, that even should all the product quality concerns be successfully addressed, considerable effort would be required to overcome the negative customer perceptions of the American experience.

Impact on Product Quality

Petro-Canada manufactures its gasoline to rigid specifications to ensure a high quality product which satisfies our customers' needs. Utilizing certain oxygenates, notably methanol and ethanol, in gasoline has been shown to adversely impact product quality in a number of key areas.

We use the term driveability to indicate the response of the vehicle (engine) to the driver's command and as such it is an indicator of overall performance of the fuel. Our tests have shown that a small but significant portion of vehicles exhibit poor driveability when operating on alcohol/gasoline blends. Typical problems encountered include poor cold starting, warm-up stumble, hesitation, surging, stalling and hot starting difficulties. In order to maintain satisfactory driveability of gasoline/alcohol blends it may be necessary to increase the RVP of the blend to levels significantly above those currently allowed in Canada. Environment Canada has stated that an increase in RVP will have significant impact on both vehicle diurnal emissions and fueling emissions. Our experience would also indicate that significant increase in RVP would result in increased incidence in vapour lock in vehicles.

Our tests have found cases of phase separation in which the alcohol component separates from the gasoline/alcohol mix in vehicle fuel tanks following the initial fill with alcohol/gasoline fuel. When this takes place, driveability deteriorates to such an extent as to be dangerous under certain situations.

Phase separation can also result in a highly corrosive product, which, in a short time, may severely damage vehicle engine components and attack storage and dispensing equipment. A number of vehicle manufacturers recommend against using alcohol/gasoline blend fuels for this reason. (See Impact on Vehicle Warranty)

Quality

Current octane measurement techniques are not felt to adequately predict the performance of alcohol/gasoline mixes under some vehicle operating conditions. Areas of concern include high speed trace knock conditions and octane availability during engine warm-up. While this may in part be due to the large sensitivity of alcohols, we do not fully understand the phenomena which has led to significant damage in some engines.

Some vehicle manufacturers have designed vehicles specifically for the use of almost neat alcohol or gasoline/alcohol blends. These vehicles are much less sensitive to alcohol related fuel problems than the general population. This may encourage the introduction of alcohol fuels.

Impact on Refining

Canadian gasoline demand has declined significantly over the past several years resulting in a large supply/demand imbalance. Although the closure of several Canadian refineries has reduced the imbalance, Canada still has, today, 64,000 m^3/d of surplus refining capacity. The blending of up to 10% oxygenates into the gasoline pool would add another 9,000 m^3/d of surplus

gasoline production capacity. The resulting drop in utilization may be sufficient to force the closure of up to four (4) Canadian refineries which otherwise might have continued to operate. This loss of jobs would be partially offset by new jobs in the oxygenate industry. However, to achieve maximum economics, oxygenate plants would be built in conjunction with existing refineries or other petrochemical complexes, minimizing the total number of new jobs created. In our view, the final result, would be a net reduction in jobs.

Canadian refineries blend significant quantities of butane into gasoline. The change in operating severities required to meet lead phaseout octane requirements will generate additional butane. Alcohols, like butane, are high vapour pressure blending components. The addition of alcohol to gasoline will result in a decrease in the amount of butane allowed in the blend if the current vapour pressure specification (RVP) is to be met. We estimate that a blend of 5% methanol and 3% ethanol/92% gasoline would reduce butane allowance from about 7.0% of the blend to about 3.4% of the blend. This represents a reduction in butane consumption of 3,200m^3/d or 51% of current C_4 demand for blending purposes. As butane is currently in a surplus situation, this would have a serious impact on the Canadian natural gas liquids business. Butane is a high octane component. Hence the apparent octane advantage of alcohol is largely offset by the reduced butane we can blend into the finished gasoline.

Impact on Distribution/Marketing

The Canadian downstream petroleum industry has over the years developed numerous agreements which allow for the exchanging of product at various locations and the use of common distribution and terminalling systems. Without these agreements, our customers would face higher prices to offset higher supply costs. However, to do this has required that the products be of similar quality, and that they can be co-mingled without a decline in product quality. The co-mingling of gasohol with other gasoline blends is not recommended as significant product quality degradation may occur. Reasons for the decline in product quality include possible phase separation, alcohol leaching into system water, and, as mentioned earlier, the non-linearity of alcohol blending properties. As a result, alcohol/gasoline blends have been limited to small local market areas and have not had access to the large common carrier pipeline distribution systems employed in Canada or in the U.S.

Another concern which must be addressed is the potential corrosion impact on underground storage tanks. Some materials in existing underground storage tanks are vulnerable to methanol attack even without the highly corrosive nature of this material in the presence of water.

Impact on Safety, Health and Environment

There is evidence indicating that alcohol/gasoline blends can contribute to increased evaporative losses through accelerated degradation of activated charcoal in vehicle cannisters. Further, exhaust emissions from alcohol

fuels contain higher concentrations of aldehydes, including formaldehyde. On the positive side there appears to be more complete combustion of the fuel resulting in lower CO and unburnt hydrocarbon emissions. Before widespread use of alcohol fuels is implemented, we feel it is important to further study and understand the occupational and public health effects of aldehydes and other unregulated emissions which these fuels produce.

Gasolines are insoluble in water. This allows relatively easy cleanup of any spills. Gasoline is also lighter than water and can be washed from contaminated areas and removed. The inclusion of alcohol components in gasoline will, in the case of a spill, result in significantly more contamination of ground water, not only by the alcohols which are water soluble, but also in that the presence of alcohol in the ground water will increase the solubility of gasoline and require significantly more intensive clean up.

MTBE, however, does not present the same degree of difficulty during spill clean up as alcohols do.

The handling of oxygenated fuels and oxygenates may require significant modifications of our current procedures and work methods. The additional oxygen available will significantly expand the products explosive range and new or modified fire fighting techniques and materials may be required to control fires. All oxygenates have oxygen available to help support the fire. In addition, light alcohols vapourize rapidly and burn with an almost colorless flame making detection and firefighting more difficult.

Impact on Vehicle Warranties

Vehicle manufacturers are modifying their position regarding alcohol/gasoline blends but for the most part they are still discouraging the use of these fuels in their vehicles because of possible deleterious effects on fuel system components. Some still publish a "not recommended" statement in their owner's manual with the clear implication that use of such fuels could invalidate their vehicle fuel system warranty. This is hardly likely to leave the customer with the feeling that they are receiving top quality in an alcohol fuel. In addition, there are the large number of older vehicles still on the road which are subject to greater risk of damage from alcohols.

Impact on Fuel Economy

Studies have shown that there is a small, approximately 1.5%, fuel economy debit with alcohol fuels as compared to standard gasolines. Consequently, widespread use of such blends will lead to an overall increase in fuel consumption.

Impact on Fuel Price

Although there are many costs associated with overcoming the various issues discussed previously, simply reviewing the market prices for the most commonly used oxygenates shows a price range from 30¢/l to 45¢/l. By the

time federal and provincial taxes are included, operating costs recovered, and some return earned on capital employed, the cost of oxygenates as fuel is 20¢/l to 35¢/l higher than gasoline. Assuming a 10% oxygenate blend, this will result in a 2-4¢/l increase in the price to the customer.

Summary

Petro-Canada believes that to be a viable, successful oil company, it must satisfy its customers. At the present level of technology the use of oxygenates in gasoline must be limited to those components which will not decrease customer satisfaction levels. On this basis the most promising oxygenate as a blend component is MTBE. Before alcohols can be seriously considered, there are significant technical, environmental and distribution barriers which must be overcome. MTBE does not have as many or as significant barriers to its use. The economics of oxygenates selection and utilization will depend upon individual company/refinery criteria for gasoline production optimization and customer satisfaction.

We believe that all oxygenates have a role to play in transportation fuels. Alcohols may best be utilized as a fuel in specifically defined vehicles or as a feedstock for other blend components such as ethers.

Any government program encouraging the use of those oxygenates which would not in themselves be economically viable will ultimately be to the detriment to the industry and our customers.

R.S. Vincent
Vice President
Refining and Technology

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Vice-président
Raffinage et technologie

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87-06-01

Mr. R. Sage
Director, Policy Analysis
Transportation Energy Branch
Energy, Mines & Resources
Ottawa, Ontario
K1A 0E4

Dear Mr. Sage:

In your letter of May 12 concerning Petro-Canada's April 29 response to the 1986 Discussion Paper on Oxygenated Gasolines prepared by Energy, Mines & Resources you raised several questions to which I would like to respond.

With regard to your first point concerning the flammability of oxygenates, we did not mean to imply that the oxygen content is sufficient to support combustion. Rather, our intention was to point out that the addition of oxygenates expands the explosive range of the gasoline blend and less external oxygen is required to support combustion than is the case for comparable hydrocarbons. As a result, a burning oxygenated gasoline mixture may be harder to snuff out than would be the case for a pure gasoline under comparable conditions.

As you are aware, between 1982 and 1985, Petro-Canada, together with other companies and federal and provincial agencies, has participated in a number of test programs, intended to evaluate the factors affecting the potential for commercial distribution of alcohol-gasoline blends. Petro-Canada to date has not undertaken any public marketing tests on a commercial basis. Our test programs have been blind tests using a mixture of unmodified staff and fleet vehicles of varying ages, sizes and types which were produced by a range of manufacturers, the objective of which was to represent the Canadian vehicle population at large. Unleaded regular fuels blended to current CGSB specifications were used throughout, under normal winter

and summer operating conditions. During these tests we observed cold start and cold driveability problems with fuels containing alcohols and a distinct overall preference by drivers for regular gasoline mixtures on the basis of vehicle performance.

During tests with fuels containing methanol we observed an increased level of lead in the lubricating oil which we believe resulted from methanol attack on gasoline tank ternplate lining, although subsequent inspection of tanks failed to conclusively prove this hypothesis. In addition to our own work, we are also aware of test results by vehicle manufacturers and others in the industry which have shown that alcohol fuels can result in:

- accelerated wear of engine piston rings and cylinder bore
- swelling of elastomeric seals in fuel systems, which in severe cases became permeable and leaked
- corrosive attack on the magnesium component of carburetor float bowls resulting in leaks on sealing surfaces and in extreme cases in pin hole leaks through the bottom of the bowl

To supplement this information, we have purchased alcohol containing fuels blended and sold commercially by our competitors and have used these fuels in an employee-based field trial. The results of this testing have led us to conclude that should Petro-Canada market a fuel of this type, we could encounter erosion of our high level of customer satisfaction in terms of poorer vehicle startability in both hot and cold weather, possible vapour lock and fuel foaming problems.

To a large extent some of the above problems are time dependent and may not be fully observable in short duration tests programs nor by a public which may switch fuel types and suppliers depending on price, availability and other factors.

As regards the European situation, while we have no direct experience in this market, we are aware that different engine specifications, driving habits and environmental conditions could effect fuel performance and acceptability. It is our understanding that in West

Germany legislation has been passed that requires all gasolines to have a minimum alcohol content. In that situation no marketer is at a disadvantage since all fuels will contain oxygenates. The disadvantage to the customer may be in terms of price if relatively expensive yet gasoline-compatible oxygenates such as MTBE are used, or it may be in terms of customer satisfaction if lower cost oxygenates such as methanol are used.

With respect to the effect on ground water of potential spills of gasolines containing MTBE, we believe the problem is much less severe than that of alcohol containing fuels. MTBE is not as soluble in water as alcohols and while it has been found to be more difficult to clean up than pure gasoline, it should be at least an order of magnitude easier to clean than alcohol containing fuels. The presence of MTBE does not significantly raise the solubility of gasoline in water whereas alcohols do, leading to greater difficulties of removing alcohols from ground water. In the event of a spill of gasoline containing methanol, the high solubility of methanol in water could mean that existing clean-up techniques would leave behind a water phase with a concentration of methanol sufficient to support combustion. Since methanol burns with a colourless flame, detection and firefighting will be more difficult than for a gasoline fire. To reduce the potential for creating such a hazardous situation, increased volumes of water will be required to dilute the methanol below the flammability range, leading to increased clean-up costs.

Lastly, with regard to the blending values for oxygenates and normal butane, we note that the Hycarb values are generally somewhat higher than we use internally:

	Petro-Canada Pure Component Blending Values				Hycarb			
Component	RVP (psia)	RON	MON	(R+M)/2	RVP (psia)	RON	MON	(R+M)/2
Ethanol	20	134	100	117	20	134	102	118
Methanol	65	110	97.3	103.6	26-42	119-127.5	95-99.5	108-113.5
MTBE	7.4	119	101	110	9	119	97	108
n-Butane	60	92.7	89.0	90.8	60	94.5	89.5	92

By themselves, these results might be interpreted to indicate a positive impact from replacing butane by oxygenates, in particular alcohols. However, the

Ethyl Canada Inc.
48 St Clair Avenue W., Toronto, Ontario M4V 2Z2 Telephone (416) 962-1611

May 27, 1987

Mr. R. Sage
Director, Policy Analysis
Transportation Energy Branch
Energy, Mines & Resources Canada
Room 520
460 O'Connor Street,
Ottawa, Ontario
K1S 5H3

Dear Mr. Sage:

We wish to comment on the 1986 Discussion Paper on Oxygenated Gasolines received by Ethyl Canada recently.

In general, we believe the report prepared by the Department of Energy, Mines and Resources Canada to be thorough and well documented. The benefits and detriments of using oxygenates in gasolines are addressed from a wide range of positions. We were surprised that Case II - Ontario FCC with Approved Lead - required the installation of 492 M^3/d isomerization capacity. It is possible that some refineries may be able to exceed 93 RON on reformer severity, and will avoid having to invest in a new isomerization unit. While raising severity may not be the optimal solution, it may be the only choice available to a refiner that has limits on the amount of money that can be borrowed.

However, we do not fully understand why the Refinery Analysis section assumed that "Ethyl" MMT Antiknock Compound would not be used if and/or when the maximum lead level 0.026 gram per litre is reached.

The economic benefits of using "Ethyl" MMT in leaded gasoline containing such a low level of lead approach the benefits of using "Ethyl" MMT in unleaded gasoline. Based on this we feel a further case showing the effect of reduced lead levels, i.e. 0.026 grams lead per litre; plus using MMT in all grades of gasoline and adding oxygenates should be included in the final report.

Report number TE-86-5 titled "Optimized Program Analysis

...Cont'd.

of the Effect of Oxygenated Fuels on Canadian Oil Refineries" provides an evaluation of using MMT in all future cases. On page II-7 the report states "with MMT allowed in unleaded gasoline and with current CGSB and ASTM specifications for gasoline distillation, methanol/ethanol economics are uneconomic or marginal. Oxygenate values and therefore refinery margins are higher in summer and lower in winter. With MMT allowed in unleaded gasoline, most oxygenates will likely be uneconomic in winter".

Referring to Table 1, we wish to highlight Cases II and 5. Both of these represent options the refining industry would likely select. This is further highlighted in Table 11 where the use of MMT generally results in lower capital investments by the refining industry. Table 12 indicates that the use of MMT results in a lower breakeven value for oxygenates which typically results in a negative incentive to use the oxygenate.

In conclusion, we suggest the linear program be allowed to select the least cost case for supplying gasoline to the Canadian consumer. The linear program will, therefore, select the optimum mixture of TEL, MMT and oxygenate in the same manner as the refinery linear program.

If you have any questions concerning these comments we would be pleased to discuss them further.

Yours very truly,

Alan E. Spence

Alan E. Spence
Senior Technical Service Representative

AES/mw

COFA
Canadian Oxygenated Fuels Association
Suite 805, 350 Sparks St., Ottawa, Ont K1R 7S8
Telephone: (613) 237-6215

RC:47:87

May 26, 1987.

Mr. Roy Sage
Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4

Dear Roy,

EM&R DISCUSSION PAPER ON OXYGENATED GASOLINES

Although we reviewed the Discussion Paper verbally with you and your colleagues, we would like to summarize the main points that we have raised.

Energy Security

Energy security is a major reason why any alternate fuel should be given consideration and is of particular importance in reviewing alcohol blends. The paper really ignores the whole question of energy security and the contribution than can be made by methanol and ethanol, for example.

Environmental Effects

The paper totally understates the environmental benefits of alcohol blends and, in so doing, negates another vital reason why alcohol blends should be supported.

(.../2)

Benefits

The paper either ignores or seriously understates the benefits that an alcohol blend fuel program will lead to in the following areas:

- health benefits
- agriculture/forestry
- the natural gas producers
- regional development
- the methanol industry.

Economic Viability

The paper does not highlight sufficiently the conditions under which alcohol blends are viable. For example, at $18/bbl (U.S.) crude oil, a 5% methanol 3% ethanol blend is viable, when lead and MMT in gasoline achieve parity with the U.S. standard and methanol is at 15 cpl and ethanol at 37 cpl.

Yours truly,

R. Colledge

Commercial Alcohols Limited

Saint-Laurent, Quebec
June 10, 1987

Energy, Mines & Resources
Energy Program
Ottawa, Ontario
K1A 0E4

Attention: Mr. Roy Sage, Director Policy Analysis
Transportation Energy Branch

Dear Roy:

Thank you for giving us the opportunity to comment on your department's «Discussion Paper on Oxygenated Gasolines - 1986».

There is a great temptation to start at Page 1 and nit-pick at details right through to Page 89. The net result would be a heterogeneous bunch of words distilled down to about five pages expressing constructive criticism, praise or sheer disbelief, which would overburden the essence of our feelings towards this simple - complex subject.

Our feelings? We are very disappointed that some years later we are still dotting i's and crossing t's while the last board is being measured to close the «window».

.../2

Have we forgotten why we made this long tedious trip? Simple things, like love and beauty, are difficult to explain and retain. We started out by saying in very simple terms that an oxygenated/biomass ethanol/alcohol blend fuel program would benefit Canada from coast to coast by providing (1) energy security (2) jobs in a large biomass industry encompassing agriculture and forestry (3) an improved environment through lead phasedown and significantly reduced carbon monoxide and hydrocarbon emissions (4) an economic alternative to lead and possibly MMT as an octane enhancer (5) economic stability to our methanol industry.

The Standing Committee on Energy, Mines and Resources recognized these Canadian benefits and recommended «the use of methanol and ethanol as blending agents in Canadian gasoline» and extensive Federal Government support of research, development and demonstration required to introduce alcohol-gasoline blends on a broad basis.

Your Minister, the Honourable Marcel Masse grasped the essence rather quickly with these encouraging words in Lloydminister, Alberta on January 26, 1987.

«We believe that alternative fuels hold tremendous potential for both the West and Canada as one element of our energy mix. By developing alternative fuels such as methanol, we can not only reduce future demand for imported oil - we can create new markets for Alberta's abundant natural gas. Indeed, by using blends of alcohol

.../3

fuels and gasoline, we could quickly displace up to 10 per cent of our demand for gasoline.

Even more exciting in the longer term is the potential to use methanol and ethanol as fuels in their own right, thereby creating major new markets for natural gas producers and Canadian farmers.

And in so doing, we could improve the air quality of our environment.

Yes, there are technical and market barriers to be overcome. But the benefits of alternative fuels - greater energy security, markets for natural gas and grain, and environmental protection - these potential benefits make a compelling case for federal, provincial and industry cooperation in alternative fuels development.»

It is interesting that Mr. Masse's tone disappears in the years of complex accretions that are gathered together in the Discussion Paper. Some of these Canadian benefits are diluted away and a relatively new contender MTBE seems to be surfacing as the prime oxygenate. Unfortunately, MTBE does little for energy security, jobs, agriculture and forestry.

In our opinion as we shy away from biomass ethanol towards MTBE or other oxygenates we are sounding the death knell of biomass conversion technology in Canada exemplified by Techtrol/Iotech Group (Montreal), Stake Tech (Oakville) and St. Lawrence Reactors Limited (Mississauga).

.../4

Commercial Alcohols signed a five-year secrecy agreement with Techtrol/Iotech in August 1985 in order to build on our long experience (1923 to 1978) in biomass fermentation and distillation and study biomass technology with the view to being one of the prime low cost fuel ethanol producers (less than 30 cents per litre). Our study of biomass to ethanol technologies covering Canada, USA and Europe and our access to confidential data has convinced us that Iotech is at the leading edge of this technology. Their integrated process includes steam explosion pretreatment, enzymatic hydrolysis, fermentation and distillation, and yields ethanol, lignin and five-carbon sugars. Iotech is maintaining a $4.2 million, one ton per day pilot plant in Ottawa. They are accepted as the world leader in cellulose enzyme technology.

An element in Iotech's remaining in Canada has been a proposed joint venture with Mohawk Oil (Edmonton) to add a 120 ton per day wood conversion demonstration plant at Mohawk's fuel ethanol plant in Minnedosa, Manitoba. A similar demonstration/enzyme plant could be located elesewhere.

It would not surprise us to see Iotech move to the USA to a more sympathetic fuel ethanol atmosphere. This will be a sad day for Canada because the investors have devoted over 14 years and much personal committment to bring this technology close to completion.

.../5

The above demonstration unit is an essential step towards a full scale 1000 to 4000 ton per day plant envisaged by CAL. In latter 1985 and early 1986 CAL was prepared to invest in Iotech's pilot plant/ demonstration plant to further this technology toward our planned full scale fuel ethanol plant.

Unfortunately, at the time the fledgeling fuel alcohol market did not take off as expected. Even today almost two years later it is still struggling for survival. Why? Here again the answers are simple: No positive endorsement or support from the Federal Government and only token interest by the oil refiners. If anything the least interest was displayed by «our» Petrocan.

Mr. Masse displayed keen ability to sort through the many irrelevancies when he stated that Canada has an oil and gas policy fostered by a strong Petroleum lobby which overrides the weak alternate energy voices.

COFA and CRFA voices are well documented in EMR and other Federal and Provincial Government departments. Their voices blend in requesting strong endorsement and some positive form of support from the Governments to assist in the promotion of methanol-ethanol blends in gasoline. Manitoba, Ontario, Alberta and British Columbia have come forth with encouraging support measures. The Federal Government is still silent. It chooses to study and debate while the oil refiners quietly take care of their octane requirements with refinery hardware.

.../6

This latter approach is questionable because it tends to increase the aromatic components of gasoline. «Oxygenates can also reduce gasoline's content of the aromatic components, benzene, toluene, and xylene. Benzene in particular is a known carcinogen. Oxygenates can thus help make gasoline a safer fuel from the health viewpoint» should be underlined and expanded on in the Discussion Paper.

We mentioned earlier that we chose not to comment on the details of the Discussion Paper. Part of the reasoning to take this unusual approach is the good constructive criticism in Mohawk Oil's letter of May 25th. They are better qualified to comment, clarify and criticise. We completely endorse their presentation.

However, we cannot resist commenting on one point. How did «the specific environmental problems that might arise from producing, using and eventually disposing of enzymes» surface as another millstone on biomass ethanol? Excuse the touch of levity but the fungus Trichoderma Reesei has been producing cellulases for millions(?) of years and has helped in chewing up cellulose wastes not to mention the infamous gun-belts or tents in WW II. I would suspect that traditional still bottoms and other standard distillery waste control measures should contain this environmental hazard.

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We sincerely hope that our comments are accepted in a constructive manner and, along with other contributors, will help to accelerate methanol-ethanol blends in the gasoline market-place. We all recognize that Government policy and regulations have a pronounced effect on this market-place.

Yours very truly,

E. Bucosky

E. Bucosky
Marketing & Technical
Manager

EB:ml

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May 6, 1987

Mr. Roy Sage
Chief, Alternative Fuels
Energy, Mines & Resources
580 Booth Street
Ottawa, Ontario
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Dear Roy:

Re: Comments on EM&R Discussion Paper on Oxygenated Gasolines

Since SLR has been quite involved in the ongoing review of the discussion paper since its inception some time ago, we are fairly comfortable with most of the technical content. From our point of view, we can summarize our final points of concern with six comments:

1. Technical concerns over oxygenated gasoline:

Although there are still some remaining technical questions, even the most die-hard opponent to oxygenates must admit that none of these technical concerns would appear to be problems which could not be overcome with the support and the cooperation from Canada's oil refiners and car manufacturers.

2. Support from oil refiners:

It must also be admitted that in all likelihood, Canada's oil refiners will use oxygenates at some point in the future, but they will probably do it on their own terms, when they need the octane or for gasoline extension. Oxygenates will not receive wide support from the refiners until they need the product or until there is an economic incentive.

3. MTBE vs Alcohols:

MTBE is an excellent octane enhancer and will probably be the first choice of the oil refiners in a "free market" even if it is more expensive than alcohols because the refiners consider MTBE to be an "in-house" solution. If the Canadian government want to see the alcohols used as oxygenates instead of MTBE, they must provide a short-term economic incentive to alcohols. If the incentive includes MTBE, alcohols will definitely lose all market opportunity. It is imperative therefore that any incentive not include MTBE if the economic justification is predicated on helping Canadian farmers in addition to the obvious environmental benefits.

MAILING ADDRESS: P.O. Box 1050, Port Credit Postal Station, Mississauga, Ontario L5G 1E8

4. **Environmental benefits of oxygenated gasoline:**

The Minister of EM&R has expressed a strong commitment to improving the Canadian environment, yet the discussion paper only deals with the "downside risks" of oxygenated fuels and nowhere discusses the "upside benefits" to the environment. Tetra-ethyl lead will definitely be phased down in Canada with the only remaining question "when not if". The discussion paper unfortunately does not address how the use of oxygenates in gasoline could accelerate Canada's present schedule for lead phasedown and MMT removal to more closely correlate with the current environmental standards for lead and MMT in the United States.

5. **Renewable Energy:**

The consideration of fuel ethanol as renewable energy was virtually ignored in the discussion paper, even though the ministry of EM&R has made several public statements recently supporting increased use of renewable energy. The development of new sources of transportation energy from "non-oil" sources is critical to Canada's future security of supply. It should also be noted that incremental octane produced from oil is achieved at the expense of energy conservation through lower yields for higher octane products; a loss of oil which will be compounded in future by the fact that this will be expensive imported oil, affecting Canada's balance of payments.

6. **Short-term vs long-term:**

MTBE has filled a market niche in the U.S. as a source of octane used in "topping off" gasoline. As such, it's potential for expansion beyond octane enhancement is essentially a "dead end". On the other hand, alcohols can not only fulfill a short-term market need as an octane enhancer, but to use the words of your Minister: **"Even more exciting in the long term is the potential to use methanol and ethanol as fuels in their own right, thereby creating major new markets for natural gas producers and Canadian farmers."**

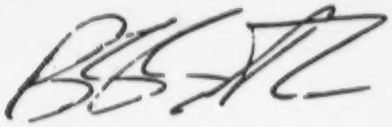
In closing, there are several other important points which we would like to make about other issues including justification for economic incentives, the use of new Canadian technology to lower fuel ethanol production costs, and the urgent need for Canadian farmers to find new domestic markets for their crops.

To make these points, we will rely on an excerpt from a recent speech by U.S. Vice President George Bush as follows:

> "Speaking of price, ethanol does have one drawback — it is more expensive to produce than gasoline. But this wouldn't necessarily mean higher prices at the pump, because of federal and state incentives already enacted to encourage alternate fuels. Moreover, as noted, greater use of ethanol blends will on balance produce net savings for the taxpayer by reducing grain storage costs and price supports. Finally, in the near future, ethanol technology — and blending with methanol - should reduce production costs and make alcohol blends cheaper than other comparable fuels."

Yours very truly,

St. Lawrence Reactors Limited



Brian S. Smith, P.Eng.
Vice President
Engineering & Business Development

cc: P.G. Assarsson
H.A. Krech
G. McNern

Ontario Corn Producers' Association

190 NICKLIN ROAD, GUELPH, ONTARIO N1H 7L5 TELEPHONE (519) 837-1660

June 8, 1987

Mr. Roy Sage
Director, Policy Analysis
Transportation Energy Branch
Energy, Mines and Resources Canada
Ottawa, Ontario
K1A 0E4

Dear Mr. Sage:

Re: Comments on EMR Discussion Paper on Oxygenated Gasolines

The Ontario Corn Producers' Association and the 28,000 farmers which it represents, is appreciative of the effort which went into the preparation of the Discussion Paper.

The report shows that oxygenates in general, and methanol-ethanol in particular, show major potential for use as octane additives for gasoline. The report also shows that if lead and MMT concentrations are reduced to match U.S. standards, ethanol and methanol represent a cost-effective means of supplying the needed octane-enhancement.

At the same time, in our opinion, the report has important deficiencies.

1. The consideration of socio-economic benefits (P. 60-76) seems far too narrow. The focus is almost exclusively on cost-benefit balances for oil refiners/marketers, although employment creation in plants producing oxygenates is also considered.

The report seems to ignore economic benefits to the rest of society -- and, in particular, benefits which would accrue to agriculture and the economy of rural Canada through the development of a major market for grain and other biological products, processed into fuel ethanol.

This deficiency seems to be the reason why the report concludes little economic benefit for the Canadian Prairies. We consider this to be incorrect. Major ethanol usage would mean major grain usage. Prairie grain would obviously be used for ethanol production for western Canada. But Prairie grain would also be used, in part, in any large-scale plants built in Ontario -- for example, at Sarnia.

As is obvious to everyone, Canada desperately needs new markets for grain. Fuel ethanol is an obvious choice.

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5. We believe that potential pipeline problems may be over-emphasized. Arco Ltd. sent methanol-containing gasoline through pipelines routinely in New York State. We understand that Suncor has sent methanol-blended gasoline by pipeline to Hamilton. And aren't pipelines cleaned on a regular basis?

6. A similar comment applies to water in service station tanks. Isn't the water in the bottoms pumped out periodically? And once the tanks are dry, alcohols should help keep them dry. Methanol is used regularly to "dewater" gasoline tanks in automobiles.

7. The report seems to endorse, in a subtle way, the view that Government should be hesitant to promote the use of alcohols via financial incentives. Yet the Government has spent large amounts of money providing incentives for developing other sources of transportation fuel.

Indeed, we ask, which represents the cheapest way of augmenting crude oil supply -- the promotion of alcohol blending, or the financing of mega-projects such as tar-sand and high-artic developments.

8. The information on driveability and fuel efficiency seems weak. If details on numbers of complants in Fig. 3.2 are unknown (Page 27), can we conclude that there was any significant difference among fuels? If drive-ability with methanol-blended fuels is poorer, why has Mohawk Oil gained market share with this product?

On Page 31, the graph seems to say, "no real difference" in fuel efficiency. This seems to contradict strongly the assumption in Section 7.1.2 that lower caloric content in oxygenated blends means greater volumetric usage for equivalent service.

We appreciate the opportunity to make comment and ask that the final paper contain a firm recommendation on the part of EMR for active support and promotion of alcohol-blended gasoline.

Sincerely,

Terry Daynard

Terry Daynard
General Manager

TBD:sm

Western Canadian Wheat Growers

May 13, 1987

The Honourable Marcel Masse
Minister of Energy, Mines and Resources
Room 201 Centre Block
House of Commons
OTTAWA, Ontario
K1A 0A6

Dear Mr. Masse,

On behalf of the Western Canadian Wheat Growers Association, I would like to respond to the Energy Mines and Resources Discussion Paper on Oxygenated Gasolines.

First of all I would like to thank the Ministry for its initiative in undertaking this study. As stated in the discussion paper summary, "oxygenates are unlikely to be widely used unless federal and provincial governments agree that they would be beneficial and cooperate to introduce them." We think the government should take an active leadership role in providing the economic and regulatory environment that would launch a value-added Canadian ethanol industry.

There are some inaccuracies or over-simplifications in the discussion paper which warrant comment or clarification. The most obvious of these is the perceived impact on western Canada, and in particular Saskatchewan and Manitoba, of using oxygenated gasolines. Page 8 of the discussion paper summary states, "Saskatchewan is not likely to benefit directly from oxygenated fuels," and further, "... there would probably be no significant impact on Manitoba." These statements totally ignore the effects the development of a locally-based ethanol industry could have in terms of regional development, alternative domestic markets for cereal grains and the resultant economic and employment spin-offs in western Canada.

We have estimated that it would require the equivalent of just under a million tonnes of cereal grains to supply the total octane requirements of western Canadian refiners if a 3% ethanol- 5% methanol blend were adopted. This would multiply to over 3 million tonnes if a 10% ethanol blend was adopted. In the case of a 10 % blend this represents 53 % of current Canadian domestic wheat usage or 70 % of western domestic barley sales.

Using the same employment multipliers for ethanol production in Ontario as in the Discussion Paper and applying them to current western refinery production, indicates a combined employment impact of similar magnitude or approximately 8300 person years.

WESTERN CANADIAN WHEAT GROWERS ASSOCIATION
201 - 4401 Albert Street, Regina, Saskatchewan • S4S 6B6 • (306) 586-5866

Thus, contrary to the findings of the discussion paper, western Canada, including Saskatchewan and Manitoba, could benefit greatly from national use of oxygenated gasolines.

With regard to the technical concerns raised in the discussion paper, it is our contention that test programs carried out in Canada, combined with commercial experience in the United States and Europe, have shown that gasoline blends do perform satisfactorily if properly formulated. We recognize that product exchange is another market barrier that must be overcome. However, as you stated in your address in Lloydminster earlier this year, the benefits of alternative fuels - greater energy security, markets for natural gas and grain, and environmental protection - make a compelling case for federal, provincial and industry cooperation in alternative fuels development.

In terms of the economic analysis that was presented in the discussion paper, we believe the study did not adequately address the use of western cereal feedstocks nor the potential for upstream or downstream integration of ethanol plants in arriving at the cost-benefit ratios for ethanol or ethanol-methanol blends in comparison to other octane sources. The assumed cost of $117 per tonne for mixed grain feed stocks used in the analysis would appear to be excessively high in light of current world prices for cereal grains. Also, in terms of integration, studies conducted by St. Lawrence Reactors indicate that a 20 million litre per year plant integrated into an existing chemical or agricultural processing plant would have a competitive advantage of up to ten cents per litre over stand-alone plants. Downstream integration with a livestock feedlot utilizing wet stillage could also provide greater economies than for stand-alone plants. We therefore feel greater sensitivity analysis and attention to integration cost savings is required before the EMR cost-benefit analysis for ethanol is accepted on face value.

We agree with the statement on the final page of the discussion paper study that there is a limited 'window of opportunity' for oxygenated fuels, caused by the phase-down of lead in Canada. Also that "once decisions to use other sources of octane are made,the opportunity to use oxygenates may be lost."

We therefore urge the federal government to seriously consider the positive benefits ethanol alone or ethanol - methanol blends can provide to Canada - additional domestic sales opportunities for Canadian cereals, enhanced employment, western diversification, as well as a cleaner environment and decreased dependency on imported light crude oil.

The government can make these benefits a reality if it dares to provide the leadership and direction required to make it happen.

We propose :

1) An accelerated lead phase-down program that would effectively eliminate lead in Canadian gasolines by 1990.

2) An environmental ban on MMT which has been banned in the United States since 1978.

3) A five year relief of federal taxes of 2-3 cents per litre on ethanol-blended fuels.

While we do not believe ethanol necessarily requires federal subsidization, tax relief would provide a major incentive to the major oil refiners to use ethanol as the preferred source of octane in Canada. If the federal government intends to provide economic incentives to build alternate octane source plants, such as the proposed Edmonton MTBE plant, ethanol must be given at least equal consideration.

Yours sincerely,

Bill Duke
President

cc: Right Hon. Brian Mulroney
Honourable Donald Mazankowski
Honourable Charles Mayer
Honourable John Wise
Honourable Tom McMillan
Honourable Jake Epp

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TECHTROL LTD.

May 29th, 1987

Right Honourable Marcel Masse
Minister of Energy, Mines & Resources
Ottawa, Ont.
K1A 0E4

Dear Sir:

Attached are three copies of our Response to the Discussion Paper on Oxygenated gasolines.

We trust that this issue will be dealt with expeditiously and will welcome comment on our suggestions directly from your office.

Yours truly,

TECHTROL LTD.

P. Foody, P.Eng.
President

PF/nn
Enc.

RESPONSE TO:

DISCUSSION PAPER ON

OXYGENATED GASOLINES

SUBMITTED BY:

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INTRODUCTION

The present Government has an excellent record of both interest in, and drawing attention to, the renewable energy option. During the period since the last election, Government initiatives have included: -

- Confirmation of the commitment to renewables made by the Prime Minister as part of his original election platform.

- A Parliamentary Committee set up to study alcohol additives in Canadian fuels.

- Positive support for the recommendations of the Parliamentary Committee.

- Commissioning an outside study to address more specifically the scope of the opportunity, and the Department's regulatory and other concerns as outlined in their response to the Parliamentary Committee Report.

- Encouragement and implementation of a public Discussion Paper by the Transportation Fuels Division of EMR.

- An initiative, currently underway, to co-ordinate the findings of the outside study with the Department's views as expressed in the Discussion Paper and to verify and

resolve issues in the most expeditious manner.

. The "Kierans" Committee has recently been established as an independent arbitrator to consider broadly Canada's comparative energy options including that of renewables.

The level of attention to alcohol additives shown during a short period has far exceeded all initiatives by the previous Government in the twelve years following formation of the OPEC Cartel.

Further, the Minister of Energy, the Right Honourable Mr. Masse, after reviewing Canada's past policies, has made the following statements: -

. "Canada does not have an energy policy. We have an oil and gas policy".

. "Canadian policy-makers have been so caught up in the issues surrounding oil and gas that they have paid too little attention to other sources of energy".

. "The Petroleum lobby is effective, while competing groups sometimes have no platform to speak from".

. There is no account of the true cost of various forms of energy figuring in all Government Subsidies".

These comments indicate a refreshing new perspective in energy policy which can only be encouraging. Clearly, the Government's aim is to have an informed and thoughtful group carrying out energy policy analysis for Canada.

The writer sympathizes with the difficulties faced by the Minister and the senior economists in understanding and summarizing a massive collection of fragmented items of incomplete technical information on alcohol fuels collected over the past 15 years.

Given this background, we will attempt to respond to the Discussion Paper in a positive manner, summarizing what we believe to be the key findings of that document as they relate to the viable Canadian options.

Initially, we will state our view that the oxygenated fuel issue should be judged by the Federal Government within the context of Canada's overall energy and economic policy and not be restricted to a determination of whether one chemical additive is more attractive to the oil industry than another, as might be implied from the Discussion Paper.

We believe that, irrelevancies and detail aside, there are three overriding practical issues which must be raised.

1. How do we attract investment to an alcohol fuels industry in Canada when there are significant incentives available in the United States to encourage investment there?

2. How do we "position" alcohol in the Canadian fuel chain against the interests of a powerful, concentrated and hostile existing energy industry?

3. It is not sufficient to suggest that the "marketplace" should be the prime factor in determining policy. There is no real "marketplace" in Canada. The narrow concentration of ownership, the closely held association between the distribution and upstream development and especially, the acceptance of refinery transfer deals, has resulted in effective cartelization of what should normally be a "marketplace".

DISCUSSION PAPER

Careful reading of the Discussion Paper elicited the following summary information:

1. OXYGENATE COSTS

The Department accepts that an ethanol/methanol blend is currently and, because of emerging technology, will most likely continue in the future to be the lowest cost "practical" option for octane enhancement in Canada.

The Parliamentary Committee concluded that this was the case, and recommended that Canada should "Get on with it". Techtrol concurs with the recommendation of the Parliamentary Committee.

2. FUEL VOLATILITY

We recognize that fuel volatility in EM blends is an issue. The Department has as yet not accepted the test data provided by the private sector or the position that current gasoline specifications are inappropriate for oxygenate fuels.

We respectfully submit, in response to the Discussion Paper, that fuel volatility requirement is not a "consensus" driven problem requiring the agreement of the Oil Companies. It is a technical problem and should be resolved on technical grounds.

The information to decide this issue is available and the test procedures are in place.

We propose that, with respect to alcohol blends, Canada move immediately to the European practice for volatility measurement as recommended to the CGSB Committee by Mohawk and endorsed by Imperial Oil, Canada's largest refiner. This simple modification to procedures, will, we understand, put EM blends within the volatility levels specified under the CGSB and will, de facto, resolve the problem.

3. ECONOMIC IMPACT

The Department accepts that of all the oxygenates, EM blends and more particularly ethanol, will have the greatest economic impact in Canada.

Ethanol production would usefully absorb projected surplus grain stocks at significantly higher than current world prices and thus equivalently reduce the level of National support required to maintain a stable farming industry.

A Government ethanol initiative would also assure Canada's continued technical leadership in the rapidly evolving field of cellulose conversion technology. Related industrial employment in equipment manufacturing and engineering would result from Canadian pre-eminence in the technology.

The employment impact from an ethanol industry exceeds all other known National opportunities. This employment would eventually spread throughout all the disadvantaged regions of the country, including the Maritimes and Quebec, further reducing the costs of National support programmes.

We attach herewith Appendix I, an extract from our recent report to the Minister of State for the Canadian Wheat Board, Mr. Mayer. This outlines the job creation potential which would arise from a positive ethanol initiative.

4. ENVIRONMENT

The Department accepts that the use of both ethanol and EM blends will result in a net improvement to the environment.

Blending ethanol or ethanol/methanol with gasoline will reduce the total noxious emissions, both tailpipe and evaporative, between 20% and 30% as compared to standard gasoline.

SUMMARY

Given the above key issues listed above, lowest cost, significant environmental improvement and maximum employment creation, it is difficult to see why the Government could permit the frustration of its efforts to understand and make effective policy in the renewables area.

We have identified two possible reasons for this:

1. DATA SATURATION

. Masses of data have been developed in a fragmented selective manner. A collation of available information on costs, environmental impact and employment prepared in tabular form with similar tabulation of unemployment and farming support costs, if an alcohol fuels programme is not implemented, should be made. Such data would assist the senior policy-makers by presenting a more complete picture and assure the public that a serious effort is underway.

2. THE EXISTING OIL INDUSTRY

. The Right Honourable Marcel Masse's comments on the effectiveness of the Petroleum Lobby, identified the current problem in a succinct way -
"The Petroleum lobby is effective, while competing groups sometimes have no platform to speak from".

. Too much attention has been focused on the perceived problems which would affect the existing oil industry in a move towards oxygenates.

. Too little attention has been focused on the necessary role of the Canadian Government in ensuring that the correct decisions are arrived at for the overall economic well-being

of all Canadians with the establishment of a more balanced energy industry.

It might be noted, in this context, that, had the PIP grants provided to the oil industry by Canadian taxpayers under the previous Government, been directed to the building of ethanol facilities, Canada would now have 60% of its gasoline needs originating from our farm and forest sectors with the addition of approximately 350,000 jobs. (These figures are based upon plant cost and employment data published by EMR).

Alternatively, the Government could initiate a truly laissez-faire policy where the private sector would operate without control or support. Unlike the accustomed "Leave it to the marketplace" position espoused selectively by the bureaucracy, while they tinker with the mechanisms through selective incentives, a "Level Playing Field" would be essential.

In order to level the playing field, given the past distortions, the EMR budget (approximately $2.0 billion/year) could be designated for investment loans to build ethanol capacity. This would offset the PIP grants already provided to the established energy industry. Such a program within a six-year period, would result in full energy self-sufficiency and 100% Canadian ownership. Government spending would be reduced by an amount equivalent to the current EMR budget,

and tax revenues would be increased significantly in a relatively short term. The creation of approximately 500,000 permanent jobs would be an added bonus. Any role for the Department would clearly then be in question.

The reader could view our comments on the shutdown of EMR as facetious. Techtrol, however, sees this as preferable to maintaining a publicly supported "Oil Lobby" within Transportation Fuels. This "Oil Lobby" has been responsible for past policy distortions and is presently running the Government and the public around in circles with repeated rehashes of information freely available from U.S. sources in the 1970's.

Techtrol is also seriously concerned that public funds will again be provided to the existing energy industry to support MTBE plant construction. The MTBE option will not proceed without ties to existing oil companies by ownership or exclusive contract. Such development will result in further cartelization of the Canadian fuels industry, enhance foreign ownership and effectively destroy, for at least a decade, an indigenous Canadian ethanol fuels industry. We have no objection to this option if the MTBE plant promoters use their own money and are subjected to the strict letter of the anti-trust laws.

Policies of the last Canadian Government ignored, and in fact discouraged ethanol in the 1970's and early 1980's. Despite predictions of $60/BBL by 1990, $8 billion was transferred from the Canadian public to the oil industry through the PIP grants. These policies left Canada without adequate octane to meet a lead phasedown requirement and resulted in our being forced into a 5-year delay on lead phasedown as compared to the U.S. The oct deficiency is a direct result of the Department's negative alcohol policies in the past.

Canada might coincidentally elect to enforce its existing anti-trust laws to improve the lot of Canadians. We refer to Mr. Wilson's 1¢/litre tax increase in the last Federal budget which showed up as 3¢/litre at the pumps to the consumer the next morning. Past practices permitted oil companies to close refineries and make exchange agreements, which left the Canadian public and the Government defenceless.

This occurence is fair comment on the "beneficial" effect for Canadians of lessened competition, highlighting the need to separate distribution ownership from production and refining to effect a free marketplace for everyone in Canada.

CONCLUSION

Permitting procrastination and delay will stifle the growth

of a renewable energy industry while pre-determining that MTBE will be the future oxygenate for Canada. The present agricultural surpluses will continue to mount and the farming sector will be in jeopardy unless objective policies are forthcoming.

RECOMMENDATIONS

The Government of Canada should follow through on its commendable start in support of alternate energy technology in time for the incorporation of an alcohol fuels initiative in the Western economic agenda by enacting the following changes:

1. Change all EMR analysts responsible for crafting the current questionable alcohols policies during the term of this review, and replace them with a fresh, open-minded analytical team to:

   a) Curtail the current preoccupation with the defense of previous publicly perceived policy errors.

   b) Restore the public's confidence in the integrity of the Department.

   c) Remove the perception that Canada's transportation fuels policy is an extension of oil company lobbying, and not national interests.

   d) Stop procrastination and ongoing regressive re-evaluating and proceed with the formation of constructive policy.

2. With the new team, review the information of the joint EMR/Agriculture/Wheat Board study and support the Wheat Board in resolving any questions which remain at issue.

   Funding must be beyond the current token level and effective EMR co-operation must be ensured.

3. Implement the recommendations of the Parliamentary Committee on fuel alcohols keeping in mind the following questions:

   a) How can the government encourage investment?

   b) How should the government deal with oil company collusion against change and sponsor national interest in fuel self-sufficiency.

   c) How can the government "level the playing field" taking into account the added value of fuel alcohol on an overall economic basis.

Implementation of a constructive and effective alcohols policy will assure the government the <u>active</u> support of the Western farming community as well as fuel alcohol advocates across the country.

APPENDIX 1

GRAIN ETHANOL OPPORTUNITY

To test the limits of the opportunity, a 3%, a 10% and a 100% ethanol economy were investigated. The following is a summary of the potential effect of these policies on Canadian Unemployment and export availability.

STATISTICS

Current Unemployment	10.6%	1,342,000 Persons
Technical Full Employment	5.6%	709,000 Persons
Employment Required		633,000 Jobs
Canadian Export Grain		22,300,000 Tonnes

ETHANOL IN MOTOR FUELS (GRAIN OPTION)

DESCRIPTION	3% BLEND (EM OCTANE ONLY)	10% BLEND (OCTANE ONLY)	100% ETHANOL
ETHANOL (LITRES)	1 billion	3.3 billion	40.0 billion
GRAIN (TONNES)	2,632,000	8,685,000	105,280,000
EMPLOYMENT (EM & R FIGURES)	17,500 PY(Const) 14,250 PY(OP/YR)	57,750 PY (Const) 47,000 PY(OP/YR)	700,000 PY(Const) 570,000 PY(OP/YR)

BASIS: Grain Price - $ 80.00/Tonne
DDG - $180.00/tonne
DCF-ROI - 15% After Tax
Tax Rate - 46%

APPENDIX 1

General Motors of Canada Limited

May 27, 1987

Mr. Roy Sage,
Director of Policy Analysis
Transportation Energy Branch
Energy, Mines and Resources Canada
580 Booth St.
Ottawa, Ontario
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Dear Roy:

This letter is in response to your request for comments regarding the "Discussion Paper on Oxygenated Fuels in Gasoline".

In general we find that this paper is an excellent analysis of the relative merits of such fuels in Canada. However, we do have some concerns that perhaps the technical drawbacks of blended fuels are understated and more importantly that the economic analysis could be misinterpreted. The attached elaborates on our concerns.

We hope you can address our concerns in your June 30, 1987 publication of key comments.

Please feel free to contact me directly at (416) 644-4171, if you have any questions.

Yours sincerely,

A. Grando

A. Grando
Manager, Powertrain Design
Engineering Department

cc: R.W. Baker
J.E. Robertson

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attachment

GM OF CANADA COMMENTS ON THE
"DISCUSSION PAPER ON OXYGENATED GASOLINES"

Technical Aspects

3.4.1 Driveability

While the facts are presented accurately, we believe that not enough emphasis was placed on the conclusion that addition of oxygenates (especially the lower alcohols) generally deteriorates driveability. As consumers become more discriminating, can any deterioration be considered or justified as "acceptable" without a clear choice or economic advantage? Many drivers currently elect to pay more for premium fuel which is perceived to be better. Would these same people pay the same amount for a fuel that has been demonstrated to deteriorate driveability?

3.4.2 Corrosion, Degradation and Wear

Although no actual long term durability data exists today, clearly the increased chemical activity of alcohols with traditionally used metals and elastomers should result in faster fuel system degradation. While new vehicles have the benefit of better materials, coatings, and warranty, the total vehicle fleet will continue to have a large percentage of older (and thus more susceptible) vehicles for many years to come. Will the consumer be informed that continuous use of certain alcohols may result in a sooner than expected replacement of fuel system components?

3.4.3 Fuel Consumption

We believe that a fuel consumption loss of 1% for typical oxygenated fuels is understated. The fuel economy performance of newer 'closed-loop' vehicles will more closely reflect the energy difference in the fuel. We also believe that the only way to demonstrate this difference is with controlled dynamometer testing ... not variable on-road data. We estimate the loss to be closer to 2%.

A.G. 5/27/87

GM OF CANADA COMMENTS ON THE
"DISCUSSION PAPER ON OXYGENATED GASOLINES"

Economic Aspects

In the end, decisions to promote or abandon oxygenated additives will be largely made or justified on economic considerations. It is therefore important that they be accurate, and we admire the comprehensive efforts taken in this discussion paper to analyze the economic impact of blending with oxygenates. In the final analysis, it is not comprehensive enough. The analysis is based on an 'average' refinery. While this may be adequate for a rough estimate of throughput impact, it will not, however, provide the true economic impact.

To clarify, assume a situation where two refineries exist. The first has significant pressure on octane levels with the removal of lead, while the second has only modest impact. The 'average' refinery would thus have an average problem in meeting required octane levels. For this 'average' refinery, blending oxygenates could well be economic versus the capital required to upgrade facilities. In the real case, the first refinery would not be able to meet octane requirements with only the addition of oxygenates. Capital investment will still be required. The second would be able to meet requirements without addition of capital or oxygenates by just reducing throughput/efficiency. Obviously, the economic analysis of 'average' refineries may be significantly different to that of the average of refineries.

In addition, the economic impact of the technical drawback of some of these fuels has not been considered. As an example, many more older vehicles will require fuel system component changes before the end of their useful life. Where is this cost to society reflected? In addition, the economic analysis is done on a gasoline volume basis. Should this not be "discounted" for the energy difference or at least for the expected 2% increase in fuel consumption?

In summary, the economic analysis to date was a great start, but it needs further refinement to present a more realistic situation.

A.G. 5/27/87

J E ELLIOT
DIRECTOR OF ENGINEERING

CHRYSLER
CANADA LT

1987-05-29

Mr. R. Sage
Director - Policy Analysis
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Ottawa, Ontario
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Dear Mr. Sage:

Discussion Paper on Oxygenated Gasolines - 1986

Chrysler Canada Ltd. appreciates the opportunity to comment on the Transportation Energy Branch's 1986 Discussion Paper on Oxygenated Gasolines.

We were encouraged to see that many of our technical concerns expressed to you at our January 8, 1986, meeting in Ottawa were given additional consideration. However, we believe effects of alcohol/gasoline blends on driveability, long-term fuel system materials compatibility and octane sensitivity are still understated. As discussed in our letter of 87-03-31 to you, the octane sensitivity of some oxygenated blends may create serious durability problems on some engines in certain circumstances. Additionally, the rate of deposit build-up in critical engine, EGR system, and carburetor throttle blade areas with alcohol/gasoline blends is not addressed. We presented data on this subject at our January 8th meeting and we remain concerned about the long-term effects on vehicle emissions deterioration and loss of performance resulting from the greater rate of deposit build-up.

Further, we hope to reach agreement shortly with ARCO to release a joint study we conducted on methanol blends and will be pleased to discuss the report with you. In the event that this agreement is not reached on a timely basis for development of your final report, a presentation could be arranged at your request as was done for E.P.A.

We also note that your economic analysis of the various blends does not take into account any costs for vehicle repairs resulting from the use of blends or, alternatively, of upgrading vehicles to be fully compatible with blends. We suspect that if this was done MTBE would look more attractive. As a result of our test program Chrysler has requested suppliers to incorporate changes to enhance fuel system component compatibility with oxygenated blends. Apart from costs, these changes are not feasible by our suppliers in many cases for several years in the future.

Perhaps our comments and concerns could be addressed in future Canadian test programs on oxygenated gasolines.

Yours very truly,

J. E. Elliot

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